भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)

TCN - 02

Ref: PSER:SCT:SDG-B1306:TCN-02 Date: 15-02-2011

Sub	Tender change notice (TCN) 02.	
Job	(i)PACKAGE-A: Erection, testing, commissioning etc of Boiler & Auxiliaries of 1X500 MW Unit#3 for 2x500 MW units at Sagardighi STPP,WB and (ii)PACKAGE-B: Erection, testing, commissioning etc of Boiler & Auxiliaries of 1X500 MW Unit#4 for 2x500 MW units at Sagardighi STPP,WB.	
Ref	1.0	Tender no PSER:SCT:SDG-B1306:12
	2.0	BHEL's NIT, vide reference no PSER:SCT:SDG-B1306:2679,dated 24-01-2012.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:SDG-B1306:TCN-01, dated 13-02-2012.
	4.0	Other references (if any).

With reference to above, following points, relevant to tender, may please be noted and complied with while submitting offer.

1.0 Revised Volume-IF-CML, Rev-1, superseding previous version.
2.0 Revised Volume-IF-TS-1, Rev-1, superseding previous version.
3.0 Inclusion of Volume-IF-TS-4, new version.
4.0 Inclusion of Volume-IF-TS-5, new version
5.0 Revised Volume-III-PKG-A, Price Schedule, Rev-1, superseding earlier version. Bidder shall submit offer as per attached revised price schedule.
6.0 Revised Volume-III-PKG-B, Price Schedule, Rev-1, superseding earlier version. Bidder shall submit offer as per attached revised price schedule.
7.0 Revised `No deviation certificate' as per enclosed Annexure-2. Bidder to submit `No deviation certificate' as per attached format only.
8.0 All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HEAVY ELECTRICALS LTD

ENGR (SCT)

Encl
As above.

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
POWER SECTOR EASTERN REGION, DJ-9/1, SALT LAKE CITY, KOLKATA - 700 091
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This volume shall be construed as part of tender document and shall be read along-with others volumes of tender. Unless otherwise specified, in case of any confusion of any clause/ provision of this volume or any conflict/ inconsistency of any clause/ provision of this volume with that of other volume, the same shall be brought out by the bidder in writing to BHEL for clarification or during pre-bid discussions, if applicable, failing which most stringent interpretation in favour of BHEL shall be adopted and the same shall be binding to the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope and for each part/ package of the tender.

1.0	**PROJECT SYNOPSIS AND GENERAL INFORMATION**
1.1	PROJECT SYNOPSIS
	Project name: Sagardighi Thermal Power Eextension Project, unit # 3 & 4, 2 x 500 MW. No of units x capacity: 2 x 500 MW (Sub-critical). Project setting up by: West Bengal Power Development Corporation Ltd. Design ambient dry bulb temp: 50 deg max, 5 deg min. Max relative humidity: 84%. Average rainfall: 1389 mm.
1.2	APPROACH TO SITE
	The site is located at Manigram, about 13 km north of Sagardighi town by the side of the SMGR (Sagardighi-Manigram-Gankar-Raghunathgunj) road at a distance 20 km. from National Highway 34 in Murshidabad district in W.B and around 240 km from Kolkata. Nearest railway station is Manigram adjacent to the site on Bandel-Barhawara branch line and 6.5 km from Sagardighi Railway Station on Sainthia-Azimgunj line of Eastern Railway. From Sagardighi railway station a railway line will branch off to the site for material unloading and coal marshalling. Nearest Airport: NSC Bose Air Port, Kolkata. Nearest Seaport: Haldia/ Kolkata.
2.0	**NAME OF WORK**
2.1	The scope broadly covers providing labour, supervision, T&Ps, consumables etc for erection, testing, commissioning, final painting, PG test, handing over, etc as per technical specification and terms & conditions of tender taking into account all clarifications, confirmations and agreements till date of boiler & auxiliaries of 1x500 MW unit # 3 (PACKAGE-A) or 2x500 MW units at Sagardighi STPP, WB.
2.2	The scope broadly covers providing labour, supervision, T&Ps, consumables etc for erection, testing, commissioning, final painting, PG test, handing over, etc as per technical specification and terms & conditions of tender taking into account all clarifications, confirmations and agreements till date of boiler & auxiliaries of 1x500 MW unit # # 4 (PACKAGE-B) for 2x500 MW units at Sagardighi STPP, WB.
3.0	**BROAD SCOPE OF WORK**
3.1	The entire scope of work comprises of receipt of materials from store/ storage yard, transportation to place of assembly/ erection, preservation, assembly, erection, testing, commissioning, final painting, handing over, providing assistance (manpower, MMDs etc) etc of main boiler and auxiliaries, rotating machines, ducts, ESP, various SG/ critical/ TG/ LP piping etc, insulation, final painting along with unloading of ODC consignment, viz boiler drum, ceiling girders, mill base assembly, as detailed in the tender.
3.2	FINAL PAINTING
	Final painting is included in the scope of the contract. Supply & application of painting for the entire scope of work is in the scope of contractor as per approved FQP and painting procedure/ painting schedule. Paints shall be of BHEL

	approved manufacturer, color and shade. Also, supply & application of touch-up painting & preservative painting of equipment & material in the custody of the contractor, as per requirement, included in the scope of contractor.
3.3	TEMPORARY PIPING
	All temporary piping system including valves and fittings required for chemical cleaning and steam blowing operation (steam as required shall be supplied by BHEL free of charge) of the unit including pre-boiler system have to be carried out by the contractor under the scope of this tender. While the erected tonnage of the temporary piping will be paid as per accepted rates of non-pressure parts, all other allied works incidental to conductance of chemical cleaning & steam blowing operation need to be carried out by the contractor within quoted/ accepted rate.
3.4	The contractor has to do contingency work like laying of pipe, valves, pipe fittings and other items, in case they are received late to achieve milestone. The contractor on a later date shall re-install the actual items on a later date as per arrival of the materials at BHEL/ site. For this purpose, the old items are to be removed and returned to BHEL/ other designated places as decided by BHEL. Payment shall be made as per accepted rate of non-pressure parts. However, for removal and returning of the contingency items, no extra payment shall be done by BHEL and the contractor has to do it treating as his normal scope of work.
3.5	MISCELLANEOUS PLATFORM/ APPROACH
	Additional platforms of permanent nature for approaching different equipment as per the site requirement, though not indicated in drawings, shall also be installed by the contractor. 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 applicable item rate of price schedule.
3.6	DESPATCH OF BOILER DRUM
	As there is no railway siding available at Sagardighi site, boiler drum shall be despatched through road only.
3.7	The scope shall also include setting up by the bidder a testing laboratory in the field to carry out all relevant tests.
3.8	All quality standards, tolerances, welding standards and other technical requirements shall be strictly adhered to. The bidder shall fully apprise themselves of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, soil conditions, local conditions and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.
3.9	The intent of this erection specification is to provide services for execution of the work according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the equipment shall not relieve the contractor of the responsibility of providing such services/ facilities to complete the work or portion of work awarded to him. The quoted/ accepted rates/ price shall deem to be inclusive of all such contingencies.
3.10	The work to be carried out under scope of this specification covers complete work of handling including receipt from stores/ yard located within project premises, arranging their issue, transportation to site, temporary storage prior to erection, if required, cleaning, preservative painting, erection, alignment, welding, leveling, adjustment etc all pre-commissioning tests, start-up and trial run of individual equipment, final commissioning including supply of erection & commissioning spares as required till handing over, and trial run and handing over of units to BHEL/ their customer including performance & guarantee (PG) test of units, reconciliation of materials issued to contractor & returning unused materials to BHEL stores/ yard/ places designated by BHEL. The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during erection. If any portion of works is found to be defective in workmanship & not conforming to drawings/ documents or other stipulations, the

	contractor shall dismantle and redo the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
3.11	It is not the intent of this specification to specify herein all the details of erection and commissioning. However, the system shall conform in all respects to high standards of quality and workmanship for performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
3.12	Omission of specific reference to any fabrication/ erection method, equipment or material necessary for proper & efficient working of the plant shall not relieve the contractor of the responsibility of providing such facilities to complete the work at quoted rates. Any mismatch/ defect found due to mistake in fabrication/ erection shall have to be rectified by the contractor free of cost. Inspection by BHEL/ customer does not relieve contractor of responsibility of executing quality erection.
3.13	Following shall be the responsibility of contractor and have to be provided within finally accepted rates/ prices.
3.13.1	Provision as required of all types of labour, supervisors, engineers, watch and ward, tools & tackles, calibrated MMD as specified and otherwise required for the work, consumables for erection, testing and commissioning including handling.
3.13.2	Proper out-turn as per BHEL plan and commitment.
3.13.3	Completion of work as per BHEL schedule.
3.13.4	Good quality and accurate workmanship for proper performance of the equipment.
3.13.5	Repair and rectification.
3.13.6	Preservation/ re-conservation of all components during storage/ erection/ commissioning till handing over.
3.14	Dismantling, removal of debris, leveling etc of all temporary buildings, structures, pipelines, cables etc as per instruction of BHEL on completion of work. If contractor fail to do so, BHEL will get the job done through other agency and the cost along with applicable overhead will be recovered from the contractor. Decision of BHEL engineer in this regard shall be final & binding on contractor. However, the scope of dismantling and leveling the area is limited only to the contractor’s site office, yard and other spaces occupied by the contractor.
3.15	All other points shall be as per the terms & conditions and specification along with aforesaid references together with amendments incorporated thereto.
4.0	**EXCLUSIONS**
	The following main items are specifically excluded from the subcontractor's scope.
4.1	C&I items appearing in Product Group 95, 96 & 97. However, some items appearing in PG 95, 96 & 97 related to pressure parts welding like soot blower orifice, metal temp pads and clamps etc are in the scope of the contractor. seal welding of screwed type thermo-wells and socket type thermo wells have to be done by the contractor without any extra cost
4.2	Testing and commissioning of all HT/ LT motors, actuators of valves/ gate/ dampers, as well as testing and commissioning of all electrical items of ESP (This supersedes any contradictory clauses, if any, appearing elsewhere in this specification regarding electrical scope of work).
4.3	Erection of power cylinders & commissioning of control valves.
4.4	Boiler elevator.
5.0	**SITE VISIT**
	Contractor should visit project site and acquire full knowledge and information about site conditions together with all the statutory, obligatory, mandatory requirements of various authorities before submission of offer.
6.0	**DEVIATIONS/ CLARIFICATIONS**
	Normally no deviation with respect to tender is acceptable to BHEL. However, in case of unavoidable circumstances, the bidder may submit their quary for seeking clarifications of BHEL as per modality stipulated in NIT or may submit the same along with his offer as per rescribed schedule/ format without any ambiguity. Any assumptions, presumptions, deviations etc indicated or implied anywhere by the

	bidder except those indicated in the deviation schedule/ format will not be recognized and will not form a part of consideration/ offer. In the absence of such filled-up schedule/ format it will be understood and agreed that the bidder's offer is based on strict conformance to the specification and no negotiation would be allowed in this regard. BHEL reserve the right not to recognize any/ all deviations submitted after opening of the bid.
7.0	**DEWATERING**
	Contractor shall ensure at all times that his work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the erection/ progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.
8.0	**GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)**
8.1	Except where otherwise specified, the plant/ equipment shall comply with appropriate Indian Standard or an agreed internationally accepted Standard Specification as mentioned elsewhere in tender, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the bidder shall give all particulars and details as necessary; to enable BHEL to identify all of the plant/ equipment in the same detail as would be possible had there been a standard specification.
8.2	Where the bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each standard specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.
8.3	In the event of any conflict between the codes & standards referred above, and requirements of this specification, the requirements which are more stringent shall govern.
8.4	Tools used during erection and commissioning/ completion shall not be accepted except with the specific approval of the engineer.
8.5	Wherever specified or required the plant/ equipment shall conform to various statutory regulations such as Indian Boiler Regulation, Indian Electricity Rules, Indian Explosive Act, Factories Act etc, wherever required, obtaining approval for plant/ equipment supplied under the specification from statutory authorities shall be the responsibility of the contractor.
9.0	**GENERAL SERVICES TO BE RENDERED BY THE BIDDER**
9.1	Services for construction, fabrication, equipment erection, testing, trial run, commissioning/ completion of various equipment & accessories/ items under the contract shall include but not be limited to the following.
9.2	Collecting materials from store/ open yard from time to time for fabrication/ erection as per the construction program as per flow of consignment. The contractor shall be the custodian of all the materials issued till the plant/ equipment is officially taken over by the owner/ BHEL after complete erection and commissioning/ completion. The contractor shall maintain adequate security personnel and security measures for proper precaution and safety of material.
9.3	Deployment of all skilled and unskilled manpower required for erection supervision, watch & ward, for commissioning/ completion and other services to be rendered under this specification.
9.4	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under scope of this specification except otherwise specified.
9.5	Supply of all consumables, eg welding electrodes, etc as well as materials required for temporary supports, scaffolding etc as necessary for such construction work, unless specified otherwise.
9.6	Providing support services for the contractor's erection staff, eg construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials

	under the contractor's custody etc, as required.
9.7	Maintaining proper documentation of all site activities undertaken by the contractor as per the proforma, mutually agreed with BHEL, submitting monthly progress reports as also any such document as and when desired by BHEL/ owner, taking approval of all statutory authorities eg, Factory Inspector, Provident Fund authority etc for respective portions of work under the jurisdiction of such statutes of laws.
9.8	As part of overall project management activity, the contractor shall be responsible for proper co-ordination of erection activities during various phases of execution of the contract. The contractor shall identify a person designated as Construction Manager, with whom BHEL shall interact on matters related to execution of the contract. The construction manager shall be the single point contact person on behalf of the contractor. BHEL shall interact with the construction manager only on all matters on co-ordination between BHEL and the contractor. For timely completion of work the contractor may have to work in one or more shifts. He will not be eligible for any extra charge on this account.
9.9	The contractor shall confine all his field operations to those works which can be reformed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms etc and during other unfavourable construction conditions. No field activities shall be performed by the contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the contractor in proper and satisfactory manner in the performance of such works and with the concurrence of the engineer. Such un-favourable construction conditions in no way relieve the contractor of his responsibility to perform the works as per the schedule.
9.10	The contractor shall supply all the skilled workmen like mill-wright fitters, welders, gas cutters, electricians, riggers, sarangs, erectors, carpenters, pipe fitters, masons, laggers, tin-smiths, instrument machanics etc, in addition to other skilled, semi-skilled and unskilled workmen required for all works of handling and transportation from site store to erection site, erection, testing and commissioning/ completion contemplated under this specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserve the right to decide on the suitability of the workers and the other personnel who will be employed by the contractor. BHEL reserves the right to insist on removal of any employee of the contractor at any time, if they find him unsuitable and the contractor shall forthwith remove him.
9.11	The supervisory staff employed by the contractor shall be technically qualified and experienced in the area of work. They shall ensure proper out turn of work and discipline on the part of labour put on the job by the contractor and in general see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL and BHEL's client.
9.12	The contractor shall also furnish daily labour report showing by classification the number of employees engaged in various categories of work a progress report of work as required by BHEL engineer.
9.13	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall co-operate with other personnel, and other contractors, coordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
9.14	The contractor's supervisory staff shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. The contractor shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerance given in the drawing / instruction given by BHEL engineer from time to time.
9.15	It is the responsibility of the contractor to engage his workman in shifts or on

	overtime basis for achieving the target set by BHEL during erection, commissioning/ completion and testing period. Contractor's quoted rate shall include all these contingencies.
9.16	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.
10.0	**PROTECTION**
10.1	Equipment having anti-friction or sleeve bearings shall be protected by weather tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces which are damaged shall be repainted.
10.2	Electrical equipments, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors
10.3	All piping, tubing and conduit connections on equipment and equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or plugs or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.
10.4	All other consumables including wire brush, emery papers, painting brush etc to be supplied by the contractor within the quoted rate.
11.0	**GENERAL GUIDELINES FOR FIELD ACTIVITIES**
11.1	The contractor shall execute the works in a professional manner so as to achieve the target schedule without any sacrifice on quality and maintaining highest standards of safety and cleanliness.
11.2	The contractor shall co-operate with owner/ BHEL and other contractors working in site and arrange to perform his work in a manner so as to minimise interference with other contractor’s works. BHEL's engineer shall be notified promptly of any defect in other contractors’ works that could affect the contractor’s work. If rescheduling of contractor’s work is requested by the owner's/ BHEL's engineer in the interest of overall site activities, the same shall be compiled with by the contractor. In all cases of controversy, the decision of BHEL shall be final and binding on the contractor without any commercial implication.
11.3	The engineer shall hold weekly meeting of all the contractors working at site at a time and a place to be designated by the engineer. The contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the engineer and shall strictly adhere to those decisions in performing this work. In addition to the above weekly meeting, engineer may call for other meetings either with individual contractors or with selected number of contractors and in such a case the contractor, if called will also attend such meetings.
11.4	Time is the essence of the contract and the contractor shall be responsible for performance of his work in accordance with the specified construction schedule. If at any time the contractor is falling behind the schedule, he shall take necessary action to make good of such delays by increasing his work to comply with the schedule and shall communicate such action in writing to the engineer, satisfying that his action will compensate for the delay. The contractor shall not be allowed any extra compensation for such action.
11.5	The engineer shall however not be responsible for provision of additional labour and or materials or supply of any other services to the contractor except for the co-ordination work between various contractors as set out earlier.
11.6	The works under execution shall be open to inspection & supervision by BHEL's / Owner's engineer at all times. The contractor shall give reasonable notice to BHEL before covering up or otherwise placing beyond the reach of inspection any work, in order that same may be verified, if so desired by owner/ BHEL.
11.7	Every effort shall be made to maintain the highest quality of workmanship by

	stringent supervision and inspection at every stage of execution. Manufacturer's instruction manual and guidelines on sequence of erection and precautions shall be strictly followed. Should any error or ambiguity be discovered in such documents the same shall be brought to the notice of BHEL's engineer. Manufacturer's interpretation in such cases shall be binding on the contractor.
11.8	The contractor shall comply with all the rules and regulations of the local authorities, all statutory laws including Minimum Wages, Workmen Compensation etc. All registration and statutory inspection fees, if any, in respect of the work executed by the contractor shall be to his account.
11.9	All the works such as cleaning, checking, levelling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipment for checking and cleaning, surface preparation, edge preparation, fabrication of tubes and pipes as per general engineering practice at site, cutting, grinding, straightening, chamfering, filling, chipping, drilling, reaming, scrapping, shaping, fitting-up, bolting/ welding, etc as may be applicable in such erection and necessary to complete the work satisfactorily, are to be treated as incidental and the same shall be carried out by the contractor as part of the work.
11.10	It is the responsibility of the contractor to do the alignment etc if necessary, repeatedly to satisfy engineer, with all the necessary tools & tackles, manpower etc. The alignment will be complete only when jointly certified so, by the contractor's engineer and BHEL. Also the contractor should ensure that the alignment is not disturbed afterwards.
11.11	Equipment and material, in case wrongly installed, shall be removed and reinstalled to comply with the design requirement at the contractor expense, to the satisfaction of BHEL/ owner.
11.12	After identification of erection materials by BHEL at BHEL's store/ storage yard, it shall be the responsibility of the contractor to take delivery of materials from BHEL's store/ storage yard by contractor's own manpower and re-stack the leftover materials as per erection sequence at BHEL store at their own cost. The entire activities are to be carried out under supervision of BHEL's engineer.
12.0	**QUALITY CONTROL & QUALITY ASSURANCE**
	Contractor’s engineers & supervisors shall be adequately qualified and also inclined to do a quality job. The quality assurance engineer shall co-ordinate all aspects of quality control, inspection, implementation of quality assurance procedures laid down in Quality Plan and technical specification by BHEL. He shall fill up quality assurance log sheets/ formats and submit to BHEL for joint inspection and acceptance. The contractor shall fill up, maintain & preserve the quality records in computerized media. BHEL’s authorized representative shall be given free access at all time to such quality related records etc for inspection, review etc.
13.0	**QUALITY ASSURANCE PROGRAMME**
13.1	The contractor shall arrange for suitable quality assurance programme to control all activities pertaining to the scope of work, as necessary. Such programs shall be outlined by the contractor & shall be finally accepted by BHEL. A quality assurance programme of the contractor shall generally cover the following
13.2	Organization structure and qualification data for key personnel of the contractor for the management and implementation of the proposed quality assurance programme.
13.3	The procedure for source inspection, incoming raw material inspection, verification of material purchased etc.
13.4	System for maintenance of records.
13.5	GENERAL REQUIREMENTS – QUALITY ASSURANCE
13.5.1	All materials, components and equipments covered under the specification shall be procured, manufactured, erected, commissioned and tested, as applicable, at all stages as per comprehensive quality assurance programme. An indicative programme for inspection/ test, to be carried out by the contractor, for some of the major items is given in the respective technical specification.
13.5.2	Field quality plan will detail out the quality practices and procedures etc to be

	followed by the contractor's site quality control organization, during various stages of site activities from receipt of material/ equipment at site.	
13.6	BHEL reserves the right to carry out quality audit and quality surveillance of the systems and procedures of contractor's quality management. Contractor shall provide all necessary assistance to enable BHEL to carry out such audit.	
13.7	Quality audit/ approval of the results of test & inspection will not prejudice the right of BHEL to reject an equipment service not giving desired performance and shall not in no way limit the liabilities and responsibilities of the contractor in earning satisfactory performances of equipment/ service as per specification.	
13.8	Repair/rectification procedure to be adopted to make any job acceptable shall be subject to the approval of BHEL.	
13.9	All the latest relevant IS codes as per technical specification should be available with the contractor at site with in 45 days from the date of placement of LOI or otherwise specified by Construction Manager/ Project Manager, BHEL.	
14.0	**HEALTH, SAFETY & ENVIRONMENT**	
14.1	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social up-liftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.	
14.2	Round the clock experienced paramedical personnel with first aid facility & one ambulance including driver, fuel etc, and shall be available at site, being provided by other agency. The above facilities will be shared by various BHEL contractors working at site (actual cost will be distributed among various contractors under BHEL at site propotionally to their contract price). The subject facility will be strengthened as per the requirement during peak work progress at site. Individual contractor may co-ordinate with the supplying/ providing agency in this regard. No medical facility within/ near the site shall be provided by BHEL. In case such facilty is not provided by the contractor of this tender, BHEL will recover cost as applicable. Decision of BHEL in this regard shall be final & binding on the contractor.	
14.3	No staff quarter shall be provided by BHEL.	
14.4	No borrow area for earth shall be arranged/ provided by BHEL.	
14.5	Common road shall be provided by BHEL free of cost, however, temporary approaches for erection/work spots under the scope of work, as required for movement of cranes, trailers, trucks, transit mixers, dumpers, etc. shall be arranged by the contractor at his own cost.	
14.6	The contractor shall solely be responsible for the safety, quality, & quantity of material after it is handed over and issued to contractor by the BHEL.	
14.7	The contractor shall ensure the safety of all workmen, materials and equipment either belonging to him or to others working at site. He shall observe safety rules and codes applied by the BHEL at site without exception.	
14.8	Passenger lift for construction purpose should have safety cage with multiple rope, ie with safety rope & limit switch.	
14.9	Safety nets with hand railings must be provided on all both inside & outside hanging platform of slip-form equipment & hanging platform from brickwork.	
14.10	Emergency vehicle must be provided & kept separately as stand-by.	
14.11	Non-conformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the contractor on each incident/ each non-conformity as per details given below.	
	Safety measure	Fine (Rs)
14.11.1	Not wearing safety helmet at site.	50
14.11.2	Not wearing safety shoes at site.	50
14.11.3	Not wearing safety belt while working at higher elevation	100
14.11.4	Not providing lifeline of safety belt	100
14.11.5	Not using grinding goggles while doing grinding operations	50
14.11.6	Not using 24V supply for lighting in confined spaces.	500
14.11.7	Improper earthing of welding & other electrical machines.	500

14.11.8	Electrical plug not used for hand machines	100
14.11.9	Not slinging properly	200
14.11.10	Using damaged slings	200
14.11.11	Using frayed/ broken welding cables	200
14.11.12	Non removal of scarp from platforms	200
14.11.13	Lifting cylinders without cage	500
14.11.14	Gas cutting without taking proper precautions or not using sheet below	200
14.11.15	Not maintaining electrical winches properly	500
14.11.16	Shorting of fuse links by thick wire	500
14.11.17	Over speeding of vehicles within in site premise	200
14.11.18	Not having valid driving license for type of vehicle being driven	500
14.11.19	Not having valid registration for the vehicle	500
14.11.20	Not providing proper barricades/ caution boards	200
14.11.21	Not displaying SWL on the lifting equipment	200
14.11.22	Sub-contractor not attending safety meeting	1000
14.11.23	Improper ladder for climbing up	500
14.11.24	Improper scaffolding arrangement	500
14.11.25	Engaging child labour for construction work	1000
14.11.26	Using domestic LPG cylinder for gas cutting/ welding operations	500
14.11.27	Not maintaining first aid box	500
14.11.28	Working without work permit/ clearance	5000
14.11.29	Working at height without full body harness, using non-standard/ rejected scaffolding and not arranging fall protection arrangement as required like safety rules.	3000
14.11.30	Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, improper storage/ handling etc)	100
14.11.31	Non-fencing of/ barricading excavated areas.	1000
14.11.32	Not providing shoring/ strutting/ proper slope and not keeping the excavated earth at least 1.5 mtr away from excavated area.	5000
14.11.33	Non display of caution borad, list of hospitals, emergency services available at work locations.	500
14.11.34	Traffic rules violation like over-speeding of vehicle, rash driving, not using seat belts, vehicle not fitted with reverse warning alarms.	1000
14.11.35	Absence of contractor's concerned representative at site safety meeting, whenever called by BHEL/ owner.	5000
14.11.36	Failure to maintain safety records.	1000
14.11.37	Failure to conduct daily safety site inspection. HSE meeting and HSE audit at predefined frequencies.	1000
14.11.38	Failure to submit monthly HSE report as per stipulated schedule to BHEL.	5000
14.11.39	Degradation of environment (Not confining toxic spills, spiling oil/ lubricants onto ground.	1000
14.11.40	Not medically examining workers before allowing them to work at height, nott providing ear muffs while allowing them to work in noise polluted areas, made them to work in air polluted areas without repiratory protective devices, etc.	1000
14.12	Any other nonconformity noticed not listed above will also be fined. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected on the above will be • ecogniz for giving award to the employee who could avoid accidents by following safety rules. Also, the amount will be spent for improving the safety at site.	
14.13	The contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislation and BHEL, as he may deem necessary.	
14.14	The contractor will notify well in advance to BHEL of his intention to bring to the site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals, which may involve hazards. BHEL shall have the right to prescribe the conditions, under which such container is to be stored,	

	handled and used during the performance of the works and the contractor shall strictly adhere to and comply with such instructions. BHEL shall have the right at his sole discretion to inspect any such container or such construction plant/equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. BHEL shall entertain no claim due to such prohibition and BHEL shall not entertain any claim of the contractor towards additional safety provisions/ conditions to be provided for/constructed as per the BHEL's instructions.
14.15	Further, any such decision of the BHEL shall not, in any way, absolve the contractor of his responsibilities and in case, use of such a container or entry thereof into the site area is forbidden by the BHEL, the contractor shall use alternative methods with the approval of the BHEL without any cost implication to BHEL or extension of work schedule.
14.16	Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying-out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act 1934, Explosives Act, 1948, and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the BHEL. In case, any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.
14.17	All equipment used in construction and erection by Contractor shall meet Indian/ International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the Contractor in accordance with manufacturer's operation Manual and safety instructions and as per Guidelines/ rules of BHEL in this regard.
14.18	Periodical examinations and all tests for all lifting/ hoisting equipment & tackles shall be carried-out in accordance with relevant provisions of Factories Act 1948, Indian Electricity Act 1910 and associated laws/ rules in force from time to time. A register of such examinations & tests shall be properly maintained by contractor and will be promptly produced as & when desired by BHEL or by the person authorized.
14.19	The contactor shall be fully responsible for the safe storage of his and his sub-contractor's radioactive sources in accordance with BARC/ DAE (Bhabha Atomic Research Center/ Department of Atomic Energy, Govt of India) rules and other applicable provisions. All precautionary measures stipulated by BARC/ DAE in connection with use, contractor would take storage and handling of such material.
14.20	The contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by BHEL who will also have right to examine these safety equipments to determine their suitability, reliability, acceptability and adaptability.
14.21	Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the Code of Practices/ Rules framed under Indian Explosives Act pertaining to handling, storage and use of explosives.
14.22	The contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection, the contractor only shall use good and standard quality of material.
14.23	The contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to BHEL or other contractors under any circum-stances, whatsoever, unless expressly permitted in writing by BHEL to handle such fuses, wiring or electrical equipment.
14.24	Before the contractor connects any electrical appliances to any plug or socket belonging to the other contactor or BHEL, he shall fulfill following.
14.24.1	Satisfy BHEL that the appliance is in good working condition.

14.24.2	Inform BHEL of the maximum current rating, voltage and phases of the appliances.
14.24.3	Obtain permission of BHEL detailing the sockets to which the appliances may be connected.
14.25	The BHEL will not grant permission to connect until following are complied with.
14.25.1	The appliance is in good condition and is fitted with suitable plug;
14.25.2	The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.
14.26	No electric cable in use by contractor/ BHEL will be disturbed without prior permission. No weight of any description will be imposed on any cable and no ladder or similar equipment will rest against or attached to it.
14.27	No repair work shall be carried out on any live equipment. BHEL must declare the equipment safe and a permit to work shall be issued by BHEL before the contractor carries out any repair work. While working on electric lines/equipments whether live or dead, suitable type and sufficient quantity of tools will have to be provided by contractor to electricians/ workmen/ officers.
14.28	The contractors shall employ necessary number of qualified, full time electricians/ electrical supervisors to maintain his temporary electrical installations.
14.29	The contractor shall employ trained safety officer to supervise day to day safety aspects of the equipments and workmen, who will co-ordinate with BHEL safety officer. In case of work being carried out through sub-contractors, sub-contractor's workmen/ employees will also be considered as the contractor's employees/ workmen for the above purpose.
14.30	The name and address of such safety officer of contractor will be promptly informed in writing to BHEL with a copy to safety officer-In charge before he starts work or immediately after any change of the incumbent is made during currency of contract.
14.31	In case any accident occurs during the construction/ erection or other associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the contractor to promptly inform the same to BHEL in prescribed form and also to all the authorities envisaged under the applicable laws.
14.32	BHEL shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/ or property, and/ or equipments. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury/ accident and he shall comply to remove shortcomings promptly.
14.33	The contractor shall not be entitled for any damages/ compensation for stoppage of work due to safety reasons above and the period of such stoppage of work will not be taken as an extension of time for completion of the facilities and will not be the ground for waiver of levy of penalty.
14.34	The contractor shall follow and comply with all safety rules of BHEL, relevant provisions of applicable laws pertaining to the safety of workmen, employees plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservation. In case of any inconformity between statutory requirement and Safety Rules of BHEL referred above, the later shall be binding on contractor unless the statutory provisions are more stringent.
14.35	In case BHEL is made to pay such compensation then the contractor is liable to reimburse BHEL such amount in addition to compensation indicated above.
14.36	These insurance covers have to be taken prior to start of his work at subject project and he shall make available the Policy to Construction Manager, BHEL for necessary verification before commencement of work. However, irrespective of such verification/ acceptance, sole responsibility to maintain adequate insurance cover for his workmen, T&P, assets etc at all times during the period of contract shall lie with the contractor. Regarding the aforesaid insurance cover, the contractor shall directly deal with Insurance Company for all matters regarding the insurance in his scope.
14.37	If the contractor does not take all safety precautions and/or fails to comply with the

	Safety Rules as prescribed by BHEL or under the applicable law for the safety of the equipment and plant and for the safety of personnel and the contractor does not prevent hazardous conditions which cause injury to his own employees or employees of other contractors, or BHEL's employees or any other person who are at site or adjacent thereto, the contractor shall be responsible for payment of compensation to employer as per the following schedule.	
14.37.1	Fatal injury or accident causing death	Rs.2,00,000 per person
14.37.2	Major injuries or accident causing 25% or more permanent disablement to workmen or employees.	Rs 50,000 per person
15.0	**SPECIFIC REQUIREMENTS FOR ISO 9002**	
15.1	Contractors shall ensure that all their staff/ employees are exposed to periodical training programmes conducted by qualified agencies/ personnel on ISO 9002 Standards.	
15.2	Contractor shall ensure that the quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.	
15.3	Contractor shall ensure that all MMDs that are used, whether owned by the contractors or used on loan, are calibrated by the authorized agencies and the valid calibration certificate will be available with them for verification by BHEL. A list of such instruments possessed by the contractor at site with its calibration status is to be submitted to BHEL Engineer for control.	
15.4	Contractor shall ensure that fitness certificate of the tools & plants, that are in use, whether owned by contractor or issued on loan, are tested by authorised agency and the valid fitness certificate is available for verification by BHEL.	
15.5	Contractors shall arrange for the inspection of the works at various stages as required by BHEL. The contractors shall take immediate corrective action for the non-conformances if any, observed and pointed out by BHEL.	
16.0	**PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT**	
	To meet the need of construction management at site, contractor shall provide the following services within quoted/ accepted rates.	
16.1	PLANNING & MONITORING	
16.1.1	The bidder shall prepare detail construction schedule (L-3) in consultation with Construction Manager, BHEL as per completion/ milestone schedule of the project. This schedule must include all milestone and key activities for each sub-systems/ components in the areas of engineering (wherever applicable), procurement, manufacture (wherever applicable), excavation/ construction/ erection. This network must conform to the overall project schedule. The bidder should also ensure monitoring of these activities at least weekly basis to start with and on daily basis whenever required by BHEL. The project schedule might ungergo revision/ modification periodically, for which the contractor may have to prepare/ modify construction schedule periodically in consultation with BHEL..	
16.1.2	The bidder shall also prepare progress report indicating progress on key activities, management summary for critical activities, list of actions requiring attention of BHEL. This schedule is to be preferably made in PRIMAVERA/ MS PROJECTS, so that the same is compatible with BHEL's project management software.	
16.1.3	The bidder will have to install 2 nos PCs (multimedia PC work station Pentium-core-2 Duo, with a processor of 1 GHz or above, Min 320 GB HDD, 4 GB RAM, 100/ 1000 MBPS LAN card) of HCL/ HP/ ZENITH/ DELL or equivalent make with Window 7 O/S and required software like MS Office 2010 Professional, AutoCAD 2010 or higher, PageMaker (7.0) etc, ADOBE PDF CREATOR with one no. laserjet printer compatible for A3 size printing (ink/ cartridge for which to be supplied as and when required), one no. laserjet printer compatible for A4 size printing (ink/ cartridge for which to be supplied as and when required) with power backup at places, as per instruction of BHEL for exclusive use of BHEL. The contractors may consider about 500 pages of printing per month in order to estimate the consumption of ink/ cartridge etc. These computers/ printers shall remain contractor's property and they will be allowed to take out the same after completion of the site works. The contractor shall provide data/ information etc in	

	prescribed formats for periodical updating of the progress reports, material management reports, updating of network pertaining to the contractor's scope of work etc. The contractor shall also provide 2 nos computer operators and 4 numbers service staff for miscellaneous service for BHEL's use at site/ Kolkata for reconciliation, progress review & day-to-day planning purpose, documentation etc. These facilities are to be provided within 30 days from date of intimation of BHEL to start the work, till completion of site works or as decided by BHEL. If contractor fails to provide computer/ printer or personnel as per requirement, for a continuous period of fifteen days or more, BHEL shall have the right to deduct the amount as per following rates on prorate basis, from contractor's RA bill or any other dues.
16.1.3.1	@ Rs 12,000 (Twelve thousand)/ month for each computer operator or at actual (rate +30%) if BHEL arranges this facility, whichever is lower.
16.1.3.2	@ Rs 8,000 (Eight thousand)/ month for each computer with printer or at actual (rate +30%) if BHEL arranges this facility, whichever is lower.
16.1.3.3	@ Rs 8,000 (Eight thousand)/ month for each service staff or at actual (rate +30%), if BHEL arranges this facility, whichever is lower.
16.1.4	The contractor's site office must have facilities of communications like Fax, E-mail, and telephone with STD facility within a month from LOI.
16.2	PROGRESS REPORTING
16.2.1	The bidder shall submit daily, weekly and monthly progress reports for work force, materials reports, consumables (gases/electrodes) report and other reports as per pro-forma considered necessary by the BHEL. In case of any failure on contractor's part to comply with this, BHEL may at its discretion, consider to withhold part payment against their RA bills.
16.2.2	The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which the contractor intends to take to make good the slippage or lost time, so that further works again proceed as per the original program and the slippages do not accumulate and effect the overall program.
16.2.3	The daily work force reports shall clearly indicate the work force deployed, category-wise specifying also the activities in which they are engaged.
16.2.4	Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed or actions to be taken for achieving targets. For discussions, the contractor shall present program of subsequent week. The contractor shall constantly update/revise his work program to meet the overall requirement.
16.2.5	Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of bidder will be held once in a month at Calcutta/ site. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
16.2.6	During construction contractor shall take an average forty colour digital photograph/ slides (indicating date) each month (not less than nine per week) of the works during progress. In case of failure in providing such photograph in each month, an amount of Rs 20,000 per month shall be deducted from contractor's RA bill.
16.2.7	Successful bidder has to provide for electronic/ computerized storing and re-production/ printing/ plotting of various data, log sheets, protocols, measurements etc. These may be stored in CD (as per requirement) and handed over to BHEL as per requirement.
16.3	SITE ORGANIZATION
16.3.1	The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all time for smooth execution of the contract headed by a competent Construction Manager (CM) for site operations with sufficient level of authority to take site decisions. Thecontractor will submit organization chart (showing the name of CM) with

	individual bio-data indicating various levels of experts to be posted for supervision in the fields of supervision and execution, quality, material management, planning, safety, etc. The organization shall be reinforced from time to time, as required to make up slippage (if any) from schedule without any commercial implication to BHEL. The organization chart is to be submitted within 10 days from the date of LOI.	
16.3.2	Following (minimum) engineering manpower with power plant construction background to be deployed at site by the successful bidders for their day to day supervision etc from date of start of work.	
16.3.2.1	Planning engineer.	1 no.
16.3.2.2	Qualified safety officers with assistants (exclusive for safety supervision for project jobs).	Officer – 2 nos. Assistant – 2 nos.
16.3.2.3	Site engineer and supervisors for supervision.	Enigineers – 4 nos. Supervisors - 8 nos.
16.3.2.4	Site engineer and supervisors for quality inspection.	Engineer – 3 nos. Supervisors – 4 nos.
16.3.2.5	NDT specialist with NDT level 2 certification.	1 no.
16.3.3	Engineer/ supervisor for other functions like store & purchase, material management, planning, FIN, administration etc are to be provided as per site requirement and not referred above.	
16.3.4	In the event of failure of the contractor to provide necessary manpower indicated above as per requirement BHEL reserve the right to deduct Rs 50,000 per man-month for engineer and Rs 30,000 per man-month for the supervisor/ safety/ quality officer/ NDT specialist from the date of deputation as indicated as above from RA bills. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement.	
16.3.5	For rendering commissioning assistance with effect from BLU till handing over of the set, a dedicated gang of six persons along with an exclusive supervisor need to be deployed by the vendor to attend the incidental works of commissioning as per the instruction of BHEL commissioning engineer. The total gang will report to BHEL and will follow instruction of BHEL's commissioning engineer. This gang with supervisor shall be separate and will be their besides other personnel to provided by the contractor for his day-to-day work. The gang (6+1 as per above) need to be provided during all shifts also whenever required by BHEL commissioning engineer. They shall be equipped with all necessary hand-tools to attend all the incidental works during commissioning.	
16.3.6	In the event of failure of the contractor to provide necessary manpower indicated above as per requirement for a continuous period of 3 days or more, BHEL reserve the right to recover the amounts at the following rates In the event of non deputation of engineer/ supervisor by the bidder, BHEL shall reserve the right to deduct Rs 30,000 per man-month for supervisor, Rs 15000 for skilled worker, Rs 10000 for semi-skilled/ un-skilled worker from the date of deputation as indicated as above from RA bills.	
16.3.7	BHEL reserve the right to reject or approve the list of personnel proposed by the contractor. The persons whose bio-data have been approved by BHEL will have to be posted at site and deviation in this regard will not be permitted unless specific & reasonable justification is made.	
16.3.8	In addition to above, a well experienced qualified engineer to be designated, as 'Project Coordinator', shall be deployed by the contractor. Such engineer shall have adequate exposure on the job and shall remain fully involved in all planning activities, guidance etc to contractor's own team during complete execution period of contract.	
16.3.9	The contractor should also submit to BHEL for approval a list of T&Ps along with their fitness certificates. The tools & tackles shall not be removed from site without	

	written permission of BHEL.
16.3.10	The contractor should also submit network programs for the erection of various items. These networks shall show owner/ BHEL hold points (CHP), which have to be cleared by owner/ BHEL, or their authorized representatives before further erection can take place. These programs for the erection would clearly identify responsibilities of the contractor and owner/ BHEL. It is the responsibility of the contractor to get the Networks approved by BHEL within four weeks of the date of finalization of award of work/ placement of LOI.
16.4	CONSTRUCTION MANAGEMENT
16.4.1	Based on the approved program, the contractor shall submit a program of construction/ erection/ commissioning for the implementation. These programs would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detail monitoring. The three monthly rolling program with the first month's program being tentative based on the site condition would be prepared based on these programs. The contractor shall also be involved along with owner/ BHEL to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.
16.4.2	The program would be jointly finalized by the site in-charge of the contractor with BHEL/ owner's project coordinator as well as the site-planning representative. The erection program will also identify sequential events matching financial turnover.
16.4.3	The contractor is liable to furnish all documentary evidences towards payment of Works Contract Tax as and when required by BHEL.
16.5	HEALTH SAFETY & ENVIRONMENT
16.5.1	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social up-liftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
16.5.2	Round the clock experienced paramedical personnel with first aid facility & one ambulance at site to be arranged by the bidder at his own cost. No medical facility within / near the site shall be provided by BHEL. However, BHEl/ owner shall provide one room (without furniture) for use as first aid.
16.5.3	All individual site erection, temporary approaches required for movement of cranes, trailers, trucks, transit mixers, dumpers, etc shall be arranged by the contractor at his own cost.
16.5.4	The contractor shall solely be responsible for the safety, quality, & quantity of material after it is handed over and issued to contractor by the BHEL.
17.0	**LAND**
17.1	Land will be provided free of cost by BHEL to the extent available/ considered necessary by BHEL to the contractor for their office, store, cement store, within plant premises. 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 storage of plant machineries & materials. The existing land shall be shared by all erections agencies.
17.2	Land, as available, may be provided for labour colony within the plot boundary by BHEL/ owner. The contractor should visit the site to asses the site condition regarding feasibility of use of land for the purpose. The contractor to construct temporary labour colony/ hutment as per his requirements after obtaining approval of formalities from statutory body
17.3	The contractor shall provide minimum 1 no overhead water tank with minimum 20 nos tap in their labour colony for drinking/ washing etc purpose. One no cemented area of suitable width, length, with tap(s) for washing purpose etc also to be provided.
17.4	The contractor shall provide minimum 20 nos of Indian type toilet in their labour colony.
17.5	The contractor will be responsible for handing back all lands, as handed over to him by BHEL/ owner.
18.0	**WATER**
18.1	BHEL will provide construction as well as drinking water at one strategic point

	within plant premises free of cost to the contractor for contractor's site office, store.
18.2	Further necessary network for construction & drinking water system for construction work shall be arranged by the bidder at his own cost.
18.3	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and the contractor shall claim no compensation for delay in work for such interruption. Contractor may make standby arrangement for water for which no separate payment shall be made by BHEL.
18.4	Contractor will have to arrange for storage of water to meet day-to-day requirement. Contractor will ensure & make necessary arrangement for adequate supply of construction water to meet the requirement of water during major concreting.
18.5	The availability of water (construction as well as drinking) in project site is limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.
18.6	Contractor shall make their own arrangement of water for labour hutment. For this purpose, on prior clearance/ approval of BHEL/ customer, contractor may be allowed to install bore well near labour hutment.
19.0	**ELECTRICITY**
19.1	CONSTRUCTION POWER & GENERAL ILLUMINATION NETWORK
	BHEL will provide construction power free of charges at 415V level at one strategic point within plant premises, each for batching plant, fabrication yard and power house area. Contractor shall make their own distribution arrangement to draw electricity. General illumination system shall be provided by BHEL. However, privision of suitable temporary lights at different floors/ working areas for execution of the work & safety of workmen shall be provided by the contractor, within the quoted rate. The illumination should be such that minimum illumination requirement as specified by Indian standards for general illumination is maintained.
19.2	If any other voltage level (other than normally available) is required, the same shall be arranged by the contractor from power supply as above. Contractor will have to 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, necessary charges including replacement by calibrated meters is to be borne by the contractor. Supply of electricity shall be governed by Indian Electricity Act and Installation Rules and other Rules & 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.
19.3	The contractor shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives/ T&Ps are deployed.
19.4	The power supply will be from the available grid. BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply/ variation in voltage level and no compensation for delay in work can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.
19.5	Contractor will have to arrange sufficient illumination at their own work areas.
19.6	The contractor should ensure that the work in critical areas is not held up in the event of power breakdown. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the responsibility of the contractor to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.
19.7	The contractor shall have to make arrangement at their own cost for illumination that will be required in the working area for execution of the work & safety of

	workmen.
19.8	Though the contruction power is provided free of charge, it is the responsibility of the contractor to ensure efficient utilization of electricity. Suitable audit shall be carried out jointly by BHEL & contractor on a periodic basis to ensure the same. In case at any point of time it is found that contruction power is being used inefficantly or for any other purpose than the intended use, the contractor will be suitably penalized as per the provision of the contract. The maximum penalty that can be imposed on the contractor shall be limited to one month's electricity charges (as will be obtained from the energy meter at drawal point) per incident of inefficient use or misuse.
19.9	Contractor shall make their own arrangement of electricity for labour hutment.
19.10	**CONSTRUCTION OF TEMPORARY OFFICE, STORES ETC**
	The contractor shall arrange at his own cost cleaning and grading of area allotted, construction of their temporary office, stores, godown, fabrication yards etc and also the watch & ward, etc.
20.0	**CONSUMABLE**
20.1	All consumables, like gas, electrodes, chemicals, lubricants etc required for the scope of work, shall be arranged by the contractor at his cost, except for those which BHEL shall provide free of cost as per tender (If applicable). Tentative list of consumables to be provided by contractor and BHEL are given in the relevant annexure of this tender. However, this list is not exhaustive & contractor have to provide all consumables for proper completion of the job.
20.2	All consumables to be used for the job shall have to be approved by owner/ BHEL prior to use as regard their brand & quality specifications. Test reports/ certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.
20.3	In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along-with overhead shall be paid by the contractor or deducted from the contractor's bills.
20.4	All the required welding electrodes 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, before procurement, regarding manufacturer, type of electrodes etc. on receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables.
20.5	BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type / band etc.
20.6	Filler wires, for tig welding of pressure parts & piping to the extent supplied by the manufacturing units of BHEL along with the components / equipments only shall be provided by BHEL free of cost. Contractor shall at his cost meet requirements of tig filler wires, if any, beyond these free issue of BHEL.
20.7	All the required gases like argon, oxygen, acetylene etc. shall be arranged by the contractor at his cost. Nitrogen gas, if required, for chemical cleaning / preservation of boiler and piping system of Package B will be provided by BHEL free of charge.
21.0	**MMD**
21.1	The contractor shall ensure deployment of reliable & calibrated measuring and monitoring devices (MMD). The MMDs shall have test calibration certificate from authorized/ Govt approved agencies. The contractor shall also keep provision of alternate engagement for such MMDs so that the work does not suffer when a particular IMTE is sent for calibration. Re-testing/ re-calibration shall also be arranged by the contractor at their own cost at regular interval during the period of use as advised by BHEL.
21.2	In the event of failure of contractor to bring necessary and sufficient MMDs, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost

	towards this along-with overhead shall be paid by the contractor or deducted from the contractor's bills.
22.0	**TEST CERTIFICATE FOR T&P**
	All T&P, lifting tackles, pulling devices and other material to be deployed/ supplied by the contractor must bear valid/ latest test certificates for their suitability before their use/ application and the documents shall be preserved at site.
23.0	**T&P TO BE PROVIDED BY BHEL AND TERMS OF ISSUE**
23.1	List of T&Ps to be provided by BHEL free of cost on sharing basis is given in the relevant annexure of this tender. The T&Ps shall be shared by various other contractors and contractor shall plan his activities accordingly in co-ordination with BHEL site engineers.
23.2	In case BHEL provide passenger-cum-goods elevator free of charges basis as per tender, the contractor shall arrange and deploy operator for the same at his cost for its operation. The routine day to day maintenance of the elevator is in the scope of contractor. But periodic planned maintenance & breakdown maintenance (not attributable to the contractor) along with necessary spares/ consumables shall be arranged by BHEL.
23.3	Special tools which are supplied by BHEL as part of maintenance tools to be handed over to customer under regular DU/ DESS numbers in various product groups may be issued to the contractor free of charges for specific activities, at the discretion of BHEL. Contractor shall return them after the completion of the specific activity, for which the tools were spared, in good working order.
23.4	The above referred T&P shall be available with Construction Manager, BHEL. The T&P shall be shared by all contractors working for BHEL at the site and distribution of these shall be done at the discretion of Construction Manager, BHEL on the requirement/ priority of the job and the availability of these items.
23.5	BHEL shall provide operator, fuel, lubricants, mobil, cardium compound, hydraulic oil, air and fuel filter etc on free of cost basis for the cranes. Regular maintenance and break down maintenance (not attributable to the contractor) of the BHEL crane is excluded from the scope of the contractor. However, necessary services as required for shortening/ extending of crane boom are included in the scope of contractor.
23.6	In case of exigency leading to crane operator not being available with BHEL, the contractor will have to deploy experienced crane operator (limited to total 30 man-days) after due permission of BHEL engineers. During such operation, the contractor shall have to take the full responsibility of safe operation of crane.
23.7	In case of non-availability of high capacity crane to be provided by BHEL due to break down, major overhauls, distribution pattern or any other reason, the contractor shall plan/ augment/ alter his activities to meet erection/ commissioning targets in consultation with BHEL and no compensation will be admissible on above ground.
23.8	In case of any machinery (given to contractor) remaining idle without any valid reason, BHEL shall withdraw the equipment immediately for allotment to the contractor next in priority.
23.9	The contractor must not use these equipments for any purpose other than what they are intended for.
23.10	If the above items issued to contractor are found not utilized/ not maintained to the satisfaction of BHEL engineer or misused, these will be withdrawn and no replacement will be done for such items.
23.11	In case of exigency of work, BHEL reserves the right to withdraw the same and no compensation shall be entertained on this account by BHEL.
23.12	Any boom reduction, extension for their use and restoration to previous state or as directed by BHEL after the use shall be the contractor's responsibility.
23.13	All the above equipment issued to contractor will be inspected periodically by BHEL engineer. In case contractor fails to make good the damages caused, BHEL will do the same at the cost of the contractor.
23.14	Consolidation of ground and arrangement of sleepers/ sand bag filling etc for safe operation/ movement of equipment including cranes/ trailers etc shall be the

	responsibility of the contractor at his cost.
23.15	In the event of BHEL issued T&P, MMDs etc, the contractor and BHEL shall maintain joint protocol about the condition of all T&P, instruments etc taken from BHEL's custody and return to BHEL after use. The contractor shall not use this equipment for purposes other than the scope of work given in this tender document. It is the responsibility of contractor to keep these equipments always in working condition and ensure their safe return in working condition to BHEL's store subject to normal wear & tear.
23.16	In the event of any damage or theft occurring to these items while in use with the contractor due to their negligence, the same shall be repaired/ replaced by the contractor at their own cost within the time stipulated by Construction Manager, BHEL. Contractor's failure to do so shall entitle BHEL to get the above done through other agency and the cost so incurred by BHEL shall be recovered from the contractor's bill.
23.17	Crane returned in defective/ damaged condition (defect/ damage occurred during use due to negligence of contractor) shall be rectified promptly to the full satisfaction of BHEL engineer failing which suitable recovery along with BHEL overheads will be made from contractor's bills/ dues.
23.18	After use of T&P items issued by BHEL the same shall be returned to BHEL in good working condition subject to normal wear & tear failing which recoveries at the book value of the item or the market rate prevailing at the time of returning the items, whichever is higher shall be made from the payments due to the contractor from BHEL from this contract or from any other contract.
24.0	**TOOLS & PLANTS, MMD TO BE PROVIDED BY CONTRACTOR**
24.1	Tentative list of T&P to be deployed by contractor for successful completion of work is given in the relevant annexure of this tender.
24.2	It may be noted that the list is not exhaustive and is only for general guidance. The contractor is required to provide all necessary T&P (other than those specified to be provided by BHEL, if any) MMDS, handing equipments for timely completion of total work as per contract. In case of project requirement, some activities may have to pre-pone. In such cases the contractor may have to deploy additional T&P. Quoted/ accepted rate shall be inclusive of such requirements.
24.3	In the event of any failure on the part of the contractor and as a result progress of work suffers, BHEL may at his discretion also terminate the contract on this ground and take out any or whole amount of the contract from the scope of the contractor. In line with this, in the event of failure of contractor to deploy necessary & sufficient T&Ps, BHEL also reserve the right to arrange the same at the risk & cost of contractor including transportation cost of same from any of BHEL site/ other agency & charges as applicable shall be deducted from contractor's RA bill, in case progress of work is suffered. Decision of BHEL in this regard will be final & binding on contractor.
24.4	Mobilisation schedule as mutually agreed at site for major T&Ps, have to be adhered to so as to meet the project requirement. Contractor will have to give give advance intimation & certification regarding capacity etc prior to dispatch of heavy equipments.
25.0	**RECONCILIATION OF BHEL ISSUED MATERIALS**
25.1	You shall submit a reconciliation statement of material s issued to you, once in two months. The same may be submitted along with RA bill.
25.2	You shall properly account for the material issued to you as specified herein to the satisfaction of BHEL certifying that the balance material are available with your custody at site.
26.0	**METHOD OF MEASUREMENT**
26.1	Where payment is to be made on the basis of weight, the weight per unit given in the BHEL document only shall be taken in to consideration. In case such information is not available in BHEL documents, then the latest relevant Indian Standards in this regard may be applied.
26.2	Spares, surplus quantity, erection contingency materials will not be paid for unless the same has been consumed in place of regular item of measurable work as per

	the rate schedule.
26.3	Where the payment is made on the basis of item rate, actual executed quantity measured jointly shall only be paid for.
26.4	It is clarified that as far as weight constituted by welding consumables and other consumables supplied by BHEL as well as by the contractor, shall be ignored for the payment purpose.
26.5	BHEL engineer's decision regarding stage of payment corresponding to progress of work, calculation of weight etc will be final and binding on the contractor.
26.6	No separate payment will be made for grouting of equipments, structures etc specified elsewhere in these specifications.
26.7	Erection of flow nozzles, flow elements, isolating device etc which are introduced after removing a part of the already erected pipeline, will be paid as per actual weight of these newly erected items. This will be in addition to the payment made for the portion being removed.
27.0	**INSURANCE**
27.1	BHEL shall arrange comprehensive MCE (marine cum erection) Insurance Policy for total project supply & services including balance of plant package covering transit risks & loss, destruction or damage during handling at site, storage, civil works, erection, testing and commissioning/ completion up to trial operation completion of each unit including theft, sabotage, fire, lightning and other natural calamities.
27.2	Contractor shall timely intimate despatches to the underwriter. The name of the underwriter and Policy No shall be intimated in due course of time.
27.3	The contractor shall be responsible for timely submission of loss/ damage/ theft to the underwriter, assistance in lodging & settlement of claim for losses/ damages/ theft/ lodging of FIR with police. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.
27.4	It is the entire responsibility of the contractor to insure his workmen against accident and injury while at work as required by the relevant rules and to pay compensation, if any, to their workmen as per workmen's compensation act. The contractor has also to insure his staff against accident/injury. The contractor has to take insurance cover for his tools and plants, assets etc.
27.5	These insurance covers have to be taken prior to start of work at project and he shall make available the policy to Construction Manager, BHEL site for necessary verification before commencement of work. However, irrespective of such verification/ acceptance, the sole responsibility to maintain adequate insurance cover for his workmen, T&P, assets etc at all times during the period of contract shall lie with the contractor. Regarding the aforesaid insurance cover, the contractor shall directly deal with the Insurance Company for all matters regarding the insurance in his scope.
27.6	The contractor will take necessary precautions/ due care to protect the material at Project site, while in his custody from any damage/ loss till the same is handed over to BHEL/ owner at project site. For lodging/ processing of insurance claim the contractor will submit necessary documents. BHEL will reserve the right to recover the loss from the contractor as detailed below in case the damage/ loss is due to negligence/ carelessness on the part of the contractor. In case of theft of material under contractor's custody, the same shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL/ owner for taking up with insurance. However this will not relieve the contractor of his contractual obligation for the materials in his custody.
27.7	It will be responsibility of the contractor to replenish the items lost/ damaged in time without hampering the schedule of work and without waiting for settlement of insurance claim. Amount received from the underwriters on settlement of insurance claim shall be passed on to the contractor as and when available.
27.8	In case the claim is summarily rejected by the underwriters due to WILFUL NEGLIGENCE of the contractor and contractor's failure to replenish the items lost/ damaged, the entire cost of repair/ replacement will be recovered from the contractor.

27.9	Other conditions of Insurance shall be as per relevant clause of GCC.	
28.0	**COMPLETION PERIOD**	
28.1	The entire work under this scope shall be successfully completed in all respect within 35 (Thirty five) months for PACKAGE-A and PACKAGE-B, each, from the date of start of work of the respective packages, as certified by Construction Manager, BHEL.	
28.2	Contractor shall mobilise resources to start the work of respective packages, ie within 15 days from date of intimation of BHEL site.	
28.3	Actual date of start of work shall be recknoned based on the certification of Construction Manager, BHEL.	
29.0	**CONSTRUCTION SCHEDULE**	
29.1	Entire work shall be carried out in accordance with the broad project milestone schedule given below, within the stipulated completion period. Within 30 days of LOI, the contractor shall discuss with BHEL site engineer & furnish detail construction schedule (L-3/ L-4) indicating all milestones on the basis of major activities and get it approved from BHEL engineer. This schedule will undergo review and based on progress vis-à-vis project requirement, contractor shall have to submit revised schedule for approval of BHEL.	
29.2	Milestone schedule of unit # 3, with a phase gap of 3 months for unit # 4.	
	Milestone	Schedule
29.2.1	Boiler erection start.	04-03-2012
29.2.2	Drum lifting.	22-08-2012
29.2.3	Hydraulic test (Drainable).	08-07-2013
29.2.4	Boiler light up.	22-04-2014
29.2.5	Chemical cleaning/ EDTA cleaning.	25-04-2014
29.2.6	Steam blowing.	07-05-2014
29.2.7	Safety valve floating.	10-06-2014
29.2.8	Synchronisation (On coal).	22-08-2014
29.2.9	Full loading.	22-09-2014
29.2.10	Trial run.	22-11-2014
29.3	Schedule for major activities/ area/ structure covered under the scope of work is attached along with tender.	
29.4	The contractor shall plan his work in such a manner so as to meet the overall project schedule, in consultation with BHEL/ owner engineer.	
29.5	Contractor shall submit daily work program based on above construction schedule. Defferement of above schedule is not acceptable. Contractor will adhere to schedule and resource planning to be augmented to ensure completion as per schedule.	
29.6	Periodic progress reviews on the entire activities of execution in respect of supply & works in scope of contractor will be held once in a month at Kolkata/ site. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.	
29.7	The phase gap between PACKAGE-A & PACKAGE-B is 3 months. However, entire work of each package shall be completed within the completion period, stipulated in the tender.	
30.0	**CERTIFICATE TOWARDS COMPLETION**	
	The work under the scope of the contractor shall be deemed to have been completed in all respects only when so certified by BHEL/ owner. The decision of BHEL in this regard shall be final and binding on the contractor.	
31.0	**EXTENSION OF TIME FOR COMPLETION**	
31.1	If the completion of work as detailed in the scope of work gets delayed beyond the contract/ completion period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the contract.	
31.2	Based on the reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified,	

	and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.	
31.2	However if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/ LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.	
31.3	A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources to be deployed by the contractor as per specified format. Review of the programme and record of shortfall shall be done.	
31.4	During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program	
31.4	At the end of total work completion as certified by BHEL engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/ levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.	
32.0	**INTEREST BEARING RECOVERABLE ADVANCE/ MOBILISATION ADVANCE**	
	Not applicable for this tender.	
33.0	**OVER RUN CHARGES**	
	Applicable as per GCC.	
34.0	**REVISION ON ACCEPTED CONTRACT RATE**	
	Not applicable in this tender.	
35.0	**PRICE VARIATION CLAUSE/ ESCALATION**	
	Applicable as per GCC (As per column `MECHANICAL PACKAGES' of the tender).	
36.0	**EXTRA/ ADDITIONAL ITEMS OF WORK**	
36.1	Extra/ additional work for all items/ systems, except for high pressure joints, shall be as per GCC.	
36.2	**EXTRA/ ADDITIONAL ITEMS OF WORK FOR HIGH PRESSURE JOINT**	
	The following are all inclusive rates applicable for rectification/ modification/ rework involving welding of high pressure joints.	
36.2.1	Unit rate per equivalent water wall joint of size OD 63.5 mm x 6.3 mm thick.	
36.2.2	Rate	
	Type of material	Average rate per joint (Rs)
36.2.2.1	Carbon steel	200.00
36.2.2.2	Alloy steel	250.00
36.2.3	The rates indicated above are firm and are not subject to any escalation during the contract period including extension if any, till the completion of work. Unit rates for welding are all inclusive but excluding scaffolding, joint preparation, cutting, edge preparation, welding and stress relieving, radiography with all consumables and tools and plants.	
36.2.4	For additional radiography, if so desired by BHEL, payment @ Rs 6.00 per cm length of film (100 mm wide) exposed and accepted by site engineer and further certified by site engineer that the length of film exposed is minimum required for carrying out the radiography shall be paid.	
36.2.5	No PVC, rate revision, over run charge/ compensation is applicable for extra works.	
36.2.6	In the event of any dispute regarding acceptance of any work as "EXTRA", the work has to be carried out by keeping man-hour and consumables record jointly signed with remark "for EHQ decision". Under no circumstances, the bidder can	

	refuse to carry out such work with pre-condition, save and except of keeping daily record of category of man-hours and consumables spent for the particular job for further consideration by EHQ at Kolkata.
37.0	**SECURITY DEPOSIT, PERFORMANCE BOND & FINAL BILL**
37.1	Security deposit shall be applicable as per relevant clause of GCC (Volume-IB).
37.2	Performance bond is not applicable for the tender.
37.3	RELEASE OF SD BG AND FINAL BILL
	In addition to other provisions of tender regarding release of SD and final bill, following provisions shall also be governing to this tender.
37.3.1	For SD BG- further extension beyond date of acceptance of final bill will not be enforced if the following is fulfilled.
37.3.1.1	Contractor discharges their responsibility in r/o of submission of final bill alongwith absolute 'No Demand Certificate' and other documents as detailed below to the satisfaction of BHEL
37.3.1.2	Joint protocol of set of documents as submitted as detailed in below is certified by site & contractor's representative.
37.3.1.3	There is no negative value of the final bill (after release of SD BG) - site to certify the same before release of SD BG.
37.3.1.4	Contractor has returned the property belonging to BHEL - site to certify the same before release of SD BG.
37.3.1.5	Contractor has submitted joint protocol against `Delay analysis', if applicable for delayed execution of job.
37.3.2	List of documents to be submitted & jointly protocoled indicating acceptance of final bill by BHEL.
37.3.2.1	Final bill.
37.3.2.2	Measurement for final bill signed, jointly signed by BHEL & contractor's representative.
37.3.2.3	Statement having cumulative joint measurement for the contract, jointly signed by BHEL & contractor's representative.
37.3.2.4	Claim by contractor for refund of security deposit.
37.3.2.5	Jointly signed material reconciliation statement.
37.3.2.6	Statement of payment received from BHEL – Bill wise (Including RA/ PVC/ ORC/ rate revision/ extra work).
37.3.2.7	No claim certificate by contractor.
37.3.2.8	Clearance certificates wherever applicable, viz clearance certificates from customer, various statutory authorities, like Labour Department, PF Authorities, Commercial Department, etc.
37.3.2.9	Notarized Indemnity Bond as per prescribed format.
38.0	**TAXES, DUTIES ETC**
38.1	All taxes, charges, royalties, duties, octroi etc and other taxes for materials obtained for the work and for the execution of the contract shall be borne by the contractor and shall not be payable extra, except Service Tax along with Educational Cess to Service Tax. Any increase of the same at any stage during execution of the contract shall have to be borne by the contractor. Quoted/ accepted rates/ price of shall be inclusive of all such requirements.
38.2	The contractor have to make their own arrangement at their cost for completing the formalities, if required, with state VAT Act authorities, for bringing their materials, plants and machinery at site. Road Permit in Form-62/ Way Bill, if required, shall be arranged by the contractor and BHEL will not supply any Road Permit/ Way Bill for this purpose. The contractor must be a registered dealer with the state VAT Act, if not Registered yet and a copy of the said registration certificate along with Tax Deduction Account Number must be provided to RAO, BHEL site.
38.3	Service Tax along with Educational Cess to Service Tax as legally leviable & payable by the Contractor under `Erection, commissioning and installation services' of Service Tax law/ Act, vide Sec-65 (105)(zzd), shall be paid by BHEL on contractor's gross bill. The contractor shall furnish proof of Service Tax registration with Central Excise Division covering the services under this contract.

	Registration should also bear endorsement for the premises from where the billing shall be done by the contractor on BHEL for this project. The contractor shall obtain prior approval of BHEL if there is any change in the above provision. BHEL will not be held to be responsible for non-compliance of various Service Tax Rules, being framed from time to time. With introduction of Cenvat Credit Rules , 2004 which came into force wef 10-09-04, Excise Duty paid on input goods including capital goods used for providing the output service and Service Tax paid on Input Service can be taken credit of against the service tax payable on output service. As such, while offering the rates, the contractor may take in to account the benefit of above provisions as the cost of input to contractor will be net of Excise Duty and service Tax and adjust their offer price accordingly to make it more competitive.				
38.3	New tax & duties, if imposed subsequent to latest due date of offer submission, as per NIT & TCN, as applicable, by statutory authority after due date of submission of latest price offer and within the contract period including extension, if any (provided reason for extension is not attributable to vendor), shall be reimbursed by BHEL at actual on production of relevant supporting document to the satisfaction of BHEL. However, the vendor shall obtain prior approval from BHEL before depositing new taxes & duties.				
38.4	TDS under Income Tax, VAT etc, if any, shall be deducted at prevailing rates on Gross Invoice Value from the running bills unless Exemption Certificate from the appropriate authority/ authorities is/ are furnished.				
39.0	**TERMS OF PAYMENT**				
39.1	The contractor shall submit his running bill (RA bill) once in a month at the end of each month in line with payment terms/ billing schedule indicated below. The RA bill complete in all respects accompanied by BHEL engineers certified/ measurement sheet, jointly signed, will be paid after passing of the bill subject to completeness & correctness. The measurement will be taken as specified in terms and conditions of contract and certified by the BHEL engineer of actual work. However, no extra payment shall be made in the event of delay in release of payment.				
39.2	Subject to any deduction which BHEL may be authorized to make under the contract, the contractor shall on the certification of the BHEL engineer at site, be entitled to payment explained hereunder.				
39.3	The accepted rates per MT for different groups shall be taken into account for releasing payments against RA bills. The terms of payment/ billing schedule of various items of price schedule are furnished below (The sl no referred hereunder corresponds to sl no of price schedule).				
39.4	PAYMENT TERMS/ BILLING SCHEDULE FOR SL NO 1.0 (GROUP-I), SL NO 2.0 (GROUP-II), SL NO 3.0 (GROUP-III) & SL NO 4.0 (GROUP-IV)				
	Stages of payment	Allocated percentage			
		Sl no 1.0 (Group-I, Pr parts)	Sl no 2.0 (Group-II, Integral/ Trim piping)	Sl no 3.0 (Group-III (Non-pr parts)	Sl no 4.0 (Group-IV, Rotating machines)
39.4.1	Completion of pre-assembly.	15%	--	15%	--
39.4.2	Placement in position.	25%	40%	25%	40%
39.4.3	Drum lifting.	1%	--	1%	--
39.4.3	Alignment, grouting & welding including bolting as required.	30%	30%	30%	30%
39.4.4	Completion of non destructive examination & stress relieving/ heat treatment.	10%	10%	--	--
39.4.5	Bolting & completion hangers	--	10%	6%	10%

	& supports etc wherever necessary.				
39.4.6	Completion of hydraulic test (drainable).	2%	3%	--	--
39.4.7	Completion of air & gas tightness test for equipment.	--	--	3%	--
39.4.8	Boiler light up and ABO.	3%	--	3%	5%
39.4.9	Completion of acid/ EDTA cleaning.	3%	--	3%	--
39.4.10	On completion of steam blowing & safety valve floating.	3%	--	--	--
39.4.11	Coal firing.	1%	--	3%	5%
39.4.12	Full loading.	1%	--	3%	5%
39.4.13	Submission of as-built drawings.	1%	2%	--	--
39.4.14	Painting.	1%	1%	4%	1%
39.4.15	Liquidation of pending points.	2%	2%	2%	2%
39.4.16	Reconciliation of issued materials.	1%	1%	1%	1%
39.4.17	Completion of all contractual obligation and de-mobilization of site office.	1%	1%	1%	1%
39.4.18	TOTAL	100%	100%	100%	100%

39.5	PAYMENT TERMS/ BILLING SCHEDULE FOR SL NO 5.0 (GROUP-V)	
	Stages of payment	Allocated percentage
39.5.1	Pre-assembly.	15%
39.5.2	Erection.	20%
Or		
39.5.1 & 39.5.2	Direct erection.	35%
39.5.3	Alignment, bolting, welding.	35%
39.5.4	Gas tightness test of ESP.	5%
39.5.5	Gas distribution test of ESP.	2%
39.5.6	Commissioning of collecting rapping system.	2%
39.5.7	Commissioning of emitting rapping system.	2%
39.5.8	Charging of all fields of ESP.	2%
39.5.9	Light-up of the unit.	4%
39.5.10	Coal firing of the unit.	3%
39.5.11	Full load of the unit.	3%
39.5.12	Painting.	3%
39.5.13	Liquidation of pending points.	2%
39.5.14	Reconciliation of issued material.	1%
39.5.15	Completion of all contractual obligation and de mobilization of site office.	1%
39.5.16	TOTAL	100%

39.6	PAYMENT TERMS/ BILLING SCHEDULE FOR SL NO 6.1 (P-91 PIPING ETC), SL NO 6.2 (OTHER ALLOY STEEL PIPING ETC), SL NO 6.3 (CARBON STEEL PIPING ETC) & SL NO 6.4 (STRUCTURE/ HANGER & SUPPORT)		
	Stages of payment	Allocated percentage	
		Sl no 6.1, 6.2 & 6.3 (P-91 piping, other alloy steel piping, carbon steel piping etc)	Sl no 6.4 (Structure/ hanger & support)
39.6.1	Completion of pre-assembly.	15%	--

39.6.2	Placement in position.	25%	52%
39.6.3	Alignment, welding, grouting & bolting as required.	30%	35%
39.6.4	Completion of non destructive examination & stress relieving/ heat treatment.	10%	--
39.6.5	Completion of hydraulic test (drainable)	4%	--
39.6.6	Pre-boiler system flushing/ chemical cleaning.	2%	--
39.6.7	Boiler light up and ABO.	2%	2%
39.6.8	Completion of steam blowing.	2%	--
39.6.9	Hot correction of hangers.	2%	2%
39.6.10	Coal firing.	2%	2%
39.6.11	Full loading.	1%	2%
39.6.12	Painting.	1%	1%
39.6.13	Submission of as-built drawings.	1%	1%
39.6.14	Liquidation of pending points.	1%	1%
39.6.15	Reconciliation of issued materials.	1%	1%
39.6.16	Completion of all contractual obligation and de mobilization of site office.	1%	1%
39.6.17	TOTAL	100%	100%
39.7	PAYMENT TERMS/ BILLING SCHEDULE FOR SL NO 7.0		
	Stages of payment		Allocated percentage
39.7.1	On completion of fabrication.		50%
39.7.2	On completion of erection.		40%
39.7.3	On coal firing.		2%
39.7.4	On full loading.		2%
39.7.5	Painting.		2%
39.7.6	Submission of as-built drawings.		1%
39.7.7	Liquidation of pending points.		1%
39.7.8	Reconciliation of issued materials.		1%
39.7.9	Completion of all contractual Obligation and de mobilization of site office.		1%
39.7.10	TOTAL		100%
39.8	PAYMENT TERMS/ BILLING SCHEDULE FOR SL NO 8.0 (GROUP-VII)		
	Stages of payment		Allocated percentage
39.8.1	Surface preparation/ void closing/ application of bituminus paints/ hook welding etc.		14%
39.8.2	Application/ erection.		60%
39.8.3	Completion of work, like sheeting, sealing completion etc.		15%
39.8.4	Boiler light up.		3%
39.8.5	Steam blowing.		1%
39.8.6	On synchronisation.		1%
39.8.7	On full loading.		2%
39.8.8	Trial operation.		2%
39.8.9	Completion of work in all respect.		2%
39.8.10	TOTAL		100%
39.9	PAYMENT TERMS/ BILLING SCHEDULE FOR SL NO 9.0 (PROVIDING ASSISTANCE FOR CONDUCTING PG TEST)		
	Stages of payment.		Allocated percentage
39.9.1	On completion of PG test.		95%
39.9.2	Completion of all contractual obligation and de-mobilization of site office.		5%
39.9.3	TOTAL		100%
39.10	PAYMENT TERMS/ BILLING SCHEDULE FOR SL NO 10.0, 11.0, 12.0, 13.0 (LP		

	PIPING ETC)	
	Stages of payment	Allocated percentage
39.10.1	On erection.	35%
39.10.2	On alignment.	5%
39.10.3	On welding/ jointing.	35%
39.10.4	On NDT.	10%
39.10.5	On hydraulic test/ UT/ leakage test.	10%
39.10.6	Liquidation of pending points.	2%
39.10.7	Reconciliation of issued materials.	2%
39.10.8	Completion of all contractual obligation and de-mobilization of site office.	1%
39.10.9	TOTAL	100%
39.11	For all items of work as per as per above break-up, interim payment shall be limited to 95 % of the gross value of interim bill on item rate basis. The balance 5 % shall be payable along with final bill. However, this 5 %, retained from each RA bill, may be released against submission of a separate bank guarantee as per Performance Bank Guarantee format, to be kept valid till final bill & guarantee period, subject to (i) Receipt of certificate that all works are completed in all respects; (ii) Reconciliation of materials/ T&P/ MMD; (iii) Completion of final bill formalities and (iv) Handing over to BHEL/ customer.	
39.12	Out of above 95 %, 1.5 % of gross bill amount shall be paid in the following manner on certification by BHEL engineer after compliance of each of following activity in each month. In case of non-fulfilment of respective activity by contractor in each month, no payment shall be made by BHEL against corresponding activity and no claim of bidder at a later date, whatsoever, in this regard shall be entertained by BHEL.	
39.12.1	0.7 % shall be paid on compliance of house keeping of contractor's working area and store/ office areas.	
39.12.2	0.3 % shall be paid on compliance of general illumination of contractor's working area and stores, office area.	
39.12.3	0.2 % shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL/ PSER and as specified in the tender.	
39.12.4	0.3 % shall be paid on compliance of applicable safety requirement as per guidelines of BHEL/ PSER and as specified in the tender.	
39.13	Contractor's RA bill, complete & correct in all respects as referred above, certified by BHEL engineer, shall be paid within 30 days of submission of bill. The measurement will be taken by BHEL engineer as per relevant clause of GCC and certify regarding actual work executed in measurement book and bills for work.	
39.14	All admissible recovered/ adjustments etc shall be made from the interim payable amount.	
39.15	BHEL site at its discretion may further split up the above percentages of break up and effect payment to suit the site condition, cash flow requirement, according to the progress of work.	
40.0	**RETENTION AMOUNT**	
	Shall be as per as per terms of payment of this volume.	
41.0	**LIQUIDATED DAMAGE**	
	Shall be as per GCC, with a ceiling of 5 %.	
42.0	**GUARANTEE**	
42.1	Even though the work will be carried out under supervision of BHEL, the contractor will be responsible for the quality of workmanship, quality of materials/ items and design for which the contractor is responsible.	
42.2	The contractor shall guarantee the work executed under the scope of the contract for a period of 12 (twelve) months from the date of start of guarantee period as certified by the engineer (ie on completion of total work under scope and/ or taking over by BHEL/ owner) and shall rectify free of cost all defects due to faulty supply or work done. In case the contractor fails to repair/ replace the defective works within the time specified by the engineer, BHEL may proceed to undertake the	

	repairs/ replace such defective works at contractor's risk & cost without prejudice to any other rights and recover the same from security deposit/ other dues.
43.0	**CONTRACT PRICE**
43.1	The bidder shall quote their rates strictly in accordance with prescribed rate schedule of Volume-III, separately for PACKAGE-A & PACKAGE-B.
43.2	Bidder may submit their offer or PACKAGE-A and/ or PACKAGE-B.
43.3	Evaluation & awarding will be done separately on total price of PACKAGE-A & PACKAGE-B.
43.4	The quantities of the various items mentioned in the BOQ cum price schedule (Volume-III) are approximate, based on very preliminary information and may vary to any extent or to be deleted altogether. The quoted rates of each item will remain firm throughout the period of execution including extension, for reasons whatsoever, as long as variation in the total value of the work executed under any part of the this contract including extra items, if any, but excluding any price variation, remains within +/- 20 % (Twenty percent) of the awarded price as per LOI/ WO.
43.5	For variation beyond aforesaid limit, the provision of GCC shall be applicable.
44.0	**OTHER TERMS**
44.1	While bidder's scope include deplyment of all resources, like T&P, materials, consumables, manpower including supervision etc for proper completion of the subject job and no sub-contracting for execution of the job is allowed by BHEL, depending on project's requirement and on prior acceptance of BHEL, bidder may associate agencies for deployment of skilled/ un-skileld manpower only for site execution. Bidder should arrange all resources, like T&P, materials, consumables, supervision etc directly for the subject job.
44.2	Drawings issued, if asny, are for tender purpose only. No additional financial implication will be entertained by BHEL at a later date on account any alteration to this.
44.3	In addition to prevalent statutory laws, act, etc, bidder shall also take into account of statutory guidelines regarding The Building and Other Construction Workers (Regulation of Employment & Condition of Service) Act, 1996 along with associated Central/ State Govt Rules.
44.4	All other term & conditions of this specification, not mentioned above shall be governed by the pertinent provisions of GCC, Volume-IB.

ANNEXURE–I
LIST OF T&P TO BE PROVIDED BY BHEL FREE OF CHARGES ON SHARING BASIS FOR EACH UNIT

SL NO	DESCRIPTION & CAPACITY OF T&P	QUANTITY	REMARKS
01	High capacity crane of 600 T capacity/ equivalent crane with ringer.	1 no	On sharing basis for limited period during the erection of structures like upper tiers of boilers, ceiling girders, roof top structures, and other structure etc for which high capacity crane is required.
02	Mid range crawler/ tyre mounted cranes (capacity 200 T or above).	1 no	On sharing basis as per requirement during the execution period
03	Crawler/ tyre mounted cranes (100-150 T) or above.	1 no	On sharing basis as per requirement during the execution period
04	Crawler/ tyre mounted crane (75 T or equivalent)	1 no	On sharing basis as per requirement during the execution period
05	EOT crane (110T/ 25 T capacity) in TG hall	1 no	On sharing basis as per requirement during the execution period.
06	Hydraulic test/ pressurizing pump (0-450/ 600 kg/ cm^2)	1 no	With necessary electrical starter
07	Acid/ chemical cleaning pump (200 TPH or equivalent with control panel)	5 nos	--- Do ---
08	Acid/ chemical injection pump	3 nos	--- Do ---
09	Huck –bolting machine	1 no	Only machine with hydraulic oil.
10	Induction heating machines	4 nos	As per requirement.
11	Passenger-cum-goods elevator	1	On dedicated basis for each boiler.

ANNEXURE–II
MAJOR T&P TO BE DEPLOYED BY THE CONTRACTOR FOR EACH UNIT

SL NO	DESCRIPTION OF EQUIPMENTS	CAPACITY	MINIMUM QUANTITY
01	Crawler crane	75 T	1 no To be deployed within 15 days from the date of start of work.
02	Tyre mounted/ crawler cranes with telescopic boom/ lattice boom	40 T	2 nos 1 no to be deployed within 15 days from date of start of work. 2nd to be deployed within 75 days from date of start of work.
03	Pick and carry crane	18 T/25 T	1 no To be deployed within 15 days from date of start of work.
04	Pick & carry tyre mounted mobile crane	10 T/ 12 T/ 14 T	4 nos 2 nos to be deployed within 15 days from date of start of work. Balance to be deployed progressively within 75 days from date of start of work.
05	Trailer	40 T	1 no To be deployed within 75 days from date of start of work
06	Tractor trolley/ trailer	25 T	As per requirement.
06	Truck	9 T/ 12 T capacity	As per requirement.
07	Wheel mounted lorry/ dip trolley	10 T	As per requirement
08	Air compressor (electric) – 7 kg/ cm^2	100 psi/ 80 cfm	As per requirement
09	TIG welding set	As per requirement	As per requirement.
10	Plasma cutting machine	10 mm	As per requirement.
11	Pre-heating/ stress relieving set (heating control panel, cables, heating elements etc)	As per requirement	As per requirement.
12	Radiography arrangement including the source.	IR 192/ cobalt 60	As per requirement
13	Radiography film viewer	As per requirement	As per requirement.
14	High frequency unit for TIG welding	As per requirement	As per requirement.
15	Digital temperature indicator	As per requirement	As per requirement.
16	Infrared sensor for temperature detector	As per requirement	As per requirement.
17	recordable ultrasonic test equipment (USM GO or higher version to meet the requirement)	As per requirement	As per requirement.
18	Gas burner arrangement	As per requirement	As per requirement.
19	Portable hardness tester	Equotip or Microdur make	As per requirement.
20	Spot welding machine	As per requirement	As per requirement.

21	Motorised pipe bending machine for bending pipes upto 100NB, thickness 12 mm	As per requirement	As per requirement.
22	Electro-hydraulic pipe bending machine	For up to 100 mm NB pipes	As per requirement.
23	Pipe bending machine – hand operated	Up to 50 mm NB pipes	As per requirement.
24	Pipe chamfering machine	For machine pipe dia upto 800 mm	As per requirement.
25	Pneumatic/ electric drive power hacksaw for pipe cutting	As per requirement	As per requirement.
26	Portable pipe cutting & chain machine	As per requirement	As per requirement.
27	DG set 300 KVA or above		1 set (To cater minimum 10 nos welding generators/ required lighting/ small drives, like grinding machines/ induction heating machine, etc)
28	Welding generator (electric & diesel)	300 amps	As per requirement (minimum 175 nos during peak requirement)
29	3 phase distribution board with complete set up for drawl of construction power	600 amp	As per requirement
30	Electric cable for drawl & distribution of construction power	As per requirement	As per requirement
31	Semi-automatic welding machine		As per requirement.
32	Dehumidifier for electrode storage room		As per requirement.
33	Baking oven and holding oven with thermostat and temperature gauge for baking coated welding electrodes	As per requirement	As per requirement.
34	Portable oven for coated welding electrodes	As per requirement	As per requirement.
35	Motorised megger	As per requirement	As per requirement.
36	Strand jacks with ropes, guides, anchors, hydraulic drive unit including control panel complete in all respect for drum lifting	As per requirement	As per requirement.
37	Winches (electric) (winches also includes wire ropes) Winches (Hand operated)	10 T 5 T 3 T Others 1 T	As per requirement.
38	Hydraulic jacks	100 T 50 T Others	As per requirement.
39	1 sec total station		As per requirement.
40	Pneumatic/ electrical torque wrenches (spec 600 ft lb)	600 ft-lb (up to min	As per requirement.

		M 64 size)	
41	Mechanical torque wrench	750 ft-lb	As per requirement.
42	Pipe beveling machine	As per requirement	As per requirement
43	Special slings and de-shakle for unloading drum and lifting of ceiling girder and handling ODC consignments		As per requirement.
44	Aluminium sheet clad profile making machine	As per requirement	As per requirement
45	Hand tools, cutting tools, grinding machines etc	As per requirement	As per requirement
46	Nibbling machine	As per requirement	As per requirement
47	Shearing machine	As per requirement	As per requirement
48	Man lifter hydraulic platform – 60 M height, maximum platform length – 10M (Carrying capacity – 8 persons, appx 1.5 MT)	For WW panel alignment & welding	As per requirement.
49	Dewatering pump with high pressure hose	For dewatering during rainy season	As per requirement.

NOTE	
1.0	The above major T&P list is indicative only. Additional T&Ps, if required have to be mobilized by you within the quoted/ accepted rate.

ANNEXURE-III
MAJOR CONSUMABLES TO BE PROVIDED BY BHEL FREE OF COST FOR EACH UNIT

SL NO	DESCRIPTION OF ITEMS
01	All lubricants, chemicals and N_2 gas as 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 .
02	TIG wires which will be supplied by BHEL units.
03	Filler rods and electrodes for pressure parts, trim/ integral piping, P91 piping system.

NOTE	
1.0	Any extra requirement of sl no 02 & 03 above will have to be supplied by the contractor within the quoted price.

ANNEXURE-IV
MAJOR CONSUMABLES TO BE PROVIDED BY THE CONTRACTOR FOR EACH UNIT

SL NO	DESCRIPTION OF ITEMS
01	Electrodes for CS , SS, AS – as required except for the special electrodes supplied by BHEL manufacturing units as specified elsewhere in the tender.
02	Different gases like O2, CO2, Argon, D/A etc.
03	CTC, petrol, diesel, kerosene – as required.
04	Lapping pastes.
05	NDE consumables.
06	Hoses and clamps of different sizes – as required.
07	Touch –up paints, preservatives and other consumables.
08	Cotton wastes, jutes etc.
09	Grouting cement as applicable.
10	Sleepers & rails for dragging of equipment like drums etc – as required.
11	Other consumables to complete the job (other than those supplied by BHEL free of cost as per relevant annexure.

NOTE	
1.0	The above list is not exhaustive and all consumables required to complete the work shall have to be arranged by the successful contractor at his own cost.

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

CLAUSE NO	DESCRIPTION
1.0	**NAME OF WORK**
2.1	The scope broadly covers providing labour, supervision, T&Ps, consumables etc for erection, testing, commissioning, final painting, PG test, handing over, etc as per technical specification and terms & conditions of tender taking into account all clarifications, confirmations and agreements till date of boiler and auxiliaries of 1x500 MW unit # 3 (PACKAGE-A) or 2x500 MW units at Sagardighi STPP, WB.
2.2	The scope broadly covers providing labour, supervision, T&Ps, consumables etc for erection, testing, commissioning, final painting, PG test, handing over, etc as per technical specification and terms & conditions of tender taking into account all clarifications, confirmations and agreements till date of boiler and auxiliaries of 1x500 MW unit # 4 (PACKAGE-B) for 2x500 MW units at Sagardighi STPP, WB.
2.0	**GENERAL COMMON REQUIREMENTS**
2.1	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.
2.2	The terminal points indicated by BHEL should be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.
2.3	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of BHEL, BHEL's customer, customer's consultants and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.
2.4	The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful and timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.
2.5	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.
2.6	All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory/ local authorities are to be arranged by the contractor at his cost in time to ensure smooth progress of work.
2.7	The boiler shall be erected as per relevant provisions of latest Indian boiler regulations and amendments / addendums thereof, if any.

2.8	The work shall conform to dimensions and tolerances specified in the various drawings/ documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to contractor's fault, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by BHEL and recoveries will be effected from the contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL.
2.9	The contractor shall perform any services, tests etc. which may not be specified but nevertheless required for the completion of work within quoted rates.
2.10	All necessary certificates and licenses required for carrying out this work are to be arranged by the contractor expeditiously.
2.11	The contractor shall execute the work in the most substantial and workmanlike manner. The stores shall be handled with care and diligence. The contractor shall maintain a store and account for the materials issued by BHEL for the subject work.
2.12	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.
2.13	All cranes, 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 him unless otherwise specified in the relevant clauses. The contractor's quoted rates should be inclusive of all such contingencies.
2.14	Pre-assembly of equipment at the pre-assembly yard for inspection, checking and erection. It is to be noted that BHEL will provide only reasonably leveled open space for pre-assembly yard. The contractor has to arrange further desired leveling of the area at their cost. The fixtures, steel structures required for temporary supporting for pre-assembly, checking, and welding for lifting and handling during pre-assembly and erection shall be arranged by the contractor at his own cost. Steel for such work if required shall be arranged by the contractor. Pre fabricated scaffoldings and platform materials required for quick assembly and dismantling is to be mobilised by the contractor for erection purpose. No Boiler components should be used by the contractor for making temporary platform, pre-assembly bed etc. the contractor should arrange for their own material for this purpose.
2.15	During the course of erection, testing and commissioning certain rework/ modification/ rectification/ repair/ fabrication etc may become necessary on account of feedback/ revision of drawing. This will also include modifications/ re-works suggested by BHEL/ customer/ other inspection group. Contractor shall carry out such rework/ modification/ rectification/ fabrication/ repair etc promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc shall be maintained by the contractor for such reworks. Claim of contractor if any, for such work will be governed by relevant section.
2.16	The structural steel required for fabrication of CAT HEAD STRUCTURE shall be provided by BHEL free of charges and shall have to be fabricated by the contractors as per direction of BHEL.
2.17	The contractor shall take delivery of the components, equipments, chemicals, 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. The contractor shall check, tally and inspect all material consignment issued to him and shall maintain proper record or the receipt of material received and such reports shall be produced by the contractor to the engineer for verification. Any deviation from packing list or damage to any component noticed during receipt of material should be immediately brought to the notice of BHEL engineer. Any claim in this regard after receipt of material by the contractor will not be entertained.
2.18	Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by contractor most expeditiously. No claim for extra payment for such work will be entertained.
2.19	Plant materials should not be used for any temporary supports/ scaffolding/ preparing pre-assembly bed etc.
2.20	The details of equipments to be erected under this contract is generally as per the schedule given in relevant annexure of this volume of tender. 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 erection documents which will be furnished in the course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.
2.21	Hangers & suspensions, supports etc for tubes, piping & ducts etc will be supplied in running/ random lengths/ sizes which shall be cut to suitable sizes and adjusted as required.
2.22	Spring suspension/ constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/ locks, cutting of excess thread length of hanger tie-rod etc. have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents/ instructions, during various stages of erection & testing and after floating of piping/ ducting during cold and hot condition will have to be done. This exercise may have to be repeated till satisfactory results are achieved.
2.23	Layout of field routed/ small bore (up to NB 100) piping shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of changes in routing the above pipelines even after completion of erection which shall be done by contractor as part of work. Necessary drawings, received from BHEL units for piping, shall be provided to contractor during execution.
2.24	Welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow metering & measurement devices and control valves to be provided on boiler & its auxiliaries and integral piping are covered within the scope of this specification. The installation of all the above items will be contractor's responsibility irrespective of following.
2.24.1	Items are not specifically indicated under the respective product groups as given in the technical specifications.
2.24.2	Items are supplied by an agency other than BHEL.
2.25	Pre-heating, NDE and post weld heat treatment for above shall be done as per the specifications as part of work.
2.26	Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/ speed switches of motors, accumulators etc are received in assembled condition as integral part of equipments. Contractor shall dismantle such instruments for calibration and hand over the same to BHEL. Storage/ re-erection calibration will be done by

	C&I erection agency.
2.27	Fixing and seal welding of thermo-wells & plugs before hydro test/ steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermo wells after hydro test/ steam blowing of lines as part of work.
2.28	Actuators/ drives of valves, dampers, gates, powered vanes etc may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.
2.29	All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. Contractor shall arrange all necessary MMDs including the motorized insulation testers for the above test.
2.30	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 free of cost on returnable basis. The same shall be returned to BHEL after the use. No claim in this regard shall be entertained by BHEL.
2.31	All the works such as cleaning, touch up painting, checking, aligning, assembling, temporary erection for alignment, dismantling of certain equipment for checking and cleaning, surface preparation, fabrication of tubes and pipes, ducts, supports, as per general engineering practices at site cutting, grinding, straightening, chamfering filing, chipping, drilling, reaming, rapping, shaping, filling up etc and other works, as may be applicable in such erection works which are treated as incidental to the erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work. All consumables including paints for touch up painting shall have to be supplied by the contractor.
2.32	Normally, the high pressure valves will have prepared edges for welding. But if it becomes necessary, the contractor will prepare new edges or re-condition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like T-pieces, weld neck flanges, reducers etc, shall be suitably matched with pipes for welding. The valves will have to be edge-matched, checked, cleaned and overhauled in full or in part before erection, after chemical cleaning and during commissioning, by the contractor as part of the scope of work.
2.33	Minor adjustments like removal of ovalities in pipes and opening or closing the fabricated bends of high pressure piping to the layout shall be considered part of the work and the contractor is required to carry out such work free of cost with specified heat treatment procedures.
2.34	Suspension for entire boiler system will have to be finally tightened by using a calibrated torque wrench. The torque wrench for the purpose has to be arranged by the contractor at his own cost and calibrated as per specification listed in various drawings. Calibration is to be done from a recognized body and certificate is to be submitted to BHEL.
2.35	Extra lengths in various fabricated ducts and piping given as erection allowance, shall have to be cut to suit site conditions. Fabricated pipes are sent in standard lengths 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. For any mismatch while matching the joints in tubes cutting, adjusting, re-welding, addition of spool pieces should be done by the contractor to match site condition without any extra payment.
2.36	HANGERS & SUPPORTS

2.36.1	Installation of all supports and hangers including welding of these supports as necessary, required for piping in this scope of work have to be carried out by the contractor.
2.36.2	Fabrication of supports wherever required, shall also be carried out by the contractor without any extra cost. Any additional support if required for effective completion of work, as advised by BHEL engineer, shall be fabricated and erected by the contractor at no extra cost. However, the raw material required for such additional supports shall be supplied by BHEL free of cost. Adjustment of all hangers supports erected and providing cold pull in the piping wherever required is included in the scope of the contractor.
2.36.3	Fabrication and erection of auxiliary supports required for supporting the main hangers and supports shall have to be carried out by the contractor as part of the scope of work. However, secondary steel required for the above shall be provided by BHEL free of cost.
2.36.4	The hanger assembly shall not be used for attachment of rigging to hoist any equipment into position. Other means shall be used to securely hold the equipment into position till the equipment supports are completely assembled and attached to the pipe and building structure, and the spring support is set to accommodate the pipe-sway. Spring suspension/ constant load hangers have to be pre-assembled and adjusted for the required loading and erected as per the instructions of BHEL engineers. Any adjustments, removal of temporary arresters/ lockers etc have to be carried out as and when required.
2.36.5	During hydraulic testing of the pipe system, all pressure parts having variable spring type supports shall be held securely in place by temporary means while constant spring type supports shall be pinned or blocked solid during test.
2.37	All the valves, dampers of ducts shall be serviced and lubricated to the satisfaction of BHEL Engineer, before erecting the same.
2.38	In case of any class of work for which there is no such specification as laid down in the contract, such as welding of stainless steel parts such work shall be carried out including supply of consumables in accordance with the instructions and requirements of the Engineer at no extra cost.
2.39	The contractor shall arrange/ organize for stage inspection of boiler components by statutory authority/ Boiler Directorate. It will be the sole responsibility of the contractor to arrange visit of the inspecting authority for conducting stage inspection of the components based on the drawings/ documents supplied by BHEL. Contractor is also expected to expedite the process of lay-out drawing approval by Boiler Directorate. Technical clarification if required during drawing approval or inspection, will be extended by BHEL. The contractor should inform in advance about the inspection schedule for putting up formal invitation through owner. Necessary inspection fees of Boiler Directorate only will be paid by BHEL/ owner in this regard.
2.40	Temporary blanking of ducts/ equipment for commissioning, if required, has to be done by contractor free of cost. Required plates will be supplied by BHEL free of cost.
2.41	Non specified jobs at the interface/ terminal points like bolting welding, gasket changing etc have to be done by the contractor within the quoted price.
2.42	All the welding, bolt connection at terminal point of this contract with other contracts (ie interfaces points) are to be done by the contractor within the quoted rate.
2.43	Instrument tapping coming on the ducts to be welded/ fitted on the duct to be done by the contractor within the accepted price.
3.0	**DETAILS OF SCOPE OF WORK**
	The scope of work under this contract covers erection, testing, commissioning, PG test, handing over etc of main boiler and auxiliaries, rotating machines, ducts, ESP, various SG/ critical/ TG piping etc, application of insulation & refractory, application of final painting along with unloading of ODC consignment as detailed in the tender, etc.
3.1	BOILER & AUXILIARIES

	The scope of work of the contractor for boiler and auxiliaries will be inclusive but not limited to following.
3.1.1	Receipt, unloading & transportation of boiler drum, burner blocks, mill bases, furnace bottom ring headers, air pre-heater centre sections.
3.1.2	Receipt of boiler drum, unloading from the trailer/ wagon and dragging inside boiler cavity and positioning on ground before erection. Similiarly the burner blocks, mill bases, furnace bottom ring headers, air pre-heater centre sections are to be also unloaded from trailers/ railway siding by the contractor and shifted to the site of erection before lifting for erection in position.
3.1.3	The scope of work includes receipt from open storage yard, stores, handling, pre-assembly, preservation, erection and comissioining etc of following major system-
3.1.4	Complete circulating system including down comers, cc pumps , headers, riser tubes etc.
3.1.5	Complete super-heater system, including headers connecting pipes, vents, drains, drain, funnels, pipelines up to Blow down tank nitrogen connections, safety valves, sampling connections, start up lines etc.
3.1.6	Complete re-heater system including headers, connecting pipes, coils drains, drain funnels, drain pipes up to blow down tank, safely valves etc.
3.1.7	De-super-heater system for super-heaters & re-heater steam temperature control, pneumatically operated diaphragm type control valves with isolating valves, block valves and bypass valves.
3.1.8	SGWC pumps complete with drive motors, high pressure coolers, lubricating system, purge & fill system, emergency cooling system, etc.
3.1.9	Economiser system including connecting pipes, headers & economiser re-circulation system.
3.1.10	Rotary air heater complete with structure, bearings, lub system etc.
3.1.11	Steam coil air pre-heater (SCAPH) with accessories.
3.1.12	All Boiler integral piping valves & fittings, including check valves, motorised isolating, motorised stop valves, motorised startup valves, blow-down valves, safety valves, and electromatic safety valves, control valves with pneumatic connection, for drum, super-heater and re-heater, safety valve escape pipings with silencers, complete steam and water sampling lines with sample coolers & collectors, chemical feed line, IBD & CBD lines, vents, RH/ SH spray control station, ECO re-circulation etc.
3.1.13	All approaches to valves and mountings including platforms.
3.1.14	Applicable air & gas duct work (Refer wt schedule) with necessary expansion joints with protection against ash erosion insulation wherever required, dampers gates, supports, access doors etc. and support steel work.
3.1.15	All the ash hoppers for boiler, economiser, air-heater stainless steel dip plates for bottom ash hopper and shield plates with refractory. The fly ash hoppers shall be provided with suitable vibration and heating arrangement to prevent ash build up.
3.1.16	Boiler roof mountings including access/ inspection doors for boiler/ furnace, air-heater, economiser, and ducts etc. and also access for power operated maintenance platform.
3.1.17	Complete soot blower and wall blower system with drains, entire piping and fittings including control valves.
3.1.18	All drain lines including trap discharge outlet with drain funnels/drain receivers and pipelines from funnels discharge up to the nearest plant drainage system.
3.1.19	Temperature measuring probe for start up (at furnace outlet) along with its starter cum control panel.
3.1.20	Complete boiler and auxiliaries supporting structural steel, walkways, platforms, ladders and gratings, hand rail, stair cases at both sides of the boilers including inter connecting walkways between steam generator operating floor and main building and connecting platform for boiler and elevator including chequered plates, kicker/ toe-guard plates wherever required, foundation bolts, nuts, fasteners, inserts, anchor channels, base

	plates, packers, shims, pipe sleeve for equipment and columns under scope.
3.1.21	Erection of elevator structure including it's bracings, connecting members and cladding structures.
3.1.22	Erection of LDO, HFO pumps, motors, heaters etc. along with applicable pipings & structures.& hoists
3.1.23	Erection of burner block, guns, ignitor etc.
3.1.24	Erection of scanner air fan with motor and its ducting up to burners.
3.1.25	Structural steel material & purlin for boiler roof, drum level and burner operating floor.
3.1.26	Complete buck stays and tie bars for pressure part system.
3.1.27	Piping (HP/ IP) work other than boiler parts but integral part of Boiler as detailed in the weight schedule.
3.1.28	All hanger components, spring cage assembly, constant load hanger and aux steel structure will be supplied as loose items. Contractor shall pick up the correct components pertaining to a hanger, assemble the component at site and erect as per the drawing/ document. Necessary cutting of rods and aux. steel structure to the required lengths shall be done at site by the contractor within his quoted rate.
3.1.29	Pulveriser fuel piping complete with gates, hangers etc.
3.1.30	Welding, radiography, heat treatment of piping joints will be as per specification enumerated in the relevant clause.
3.1.31	All ducts (both air & flue gas) required for boiler up to chimney and inside the chimney up to limit point.
3.1.32	Primary air (PA) fan with drives including suction and discharge duct.
3.1.33	Seal air fans and drives, Feeders including Mill/Feeder Air System.
3.1.34	Pulveriser and motors with their handling devices, monorails etc.
3.1.35	Forced draught (FD) fans and motors including suction duct.
3.1.36	Induced draught (ID) fans including drive motors.
3.1.37	Lube oil equipment assemblies as below.
3.1.38	For ID fan.
3.1.39	For FD fan.
3.1.40	For PA fan.
3.1.41	For pulverisers.
3.1.42	Run way beams and lifting tackles for maintenance of FD, ID, PA, mills.
3.1.43	Maintenance platform for FD, ID, PA fans and mills, valves, actuators, dampers, gates, coal burners, oil burners, PG test points for ESP & boiler.
3.1.44	Temporary piping for steam blowing and acid cleaning, detergent flushing, temporary drain to waste
3.1.45	Corrugated sheeting of roof top and burner weather protection sheeting along with fasteners, bitumen washers etc.
3.1.46	All ducts (both air & flue gas) required for coal firing.
3.1.47	Complete water cooled furnace wall system complete with down comer including header drains, drain funnels, drain pipelines up to & including blow down tank and necessary stubs for chemical cleaning , nitrogen purging and wet lay-up.
3.1.48	All interconnecting steel platforms, between boiler & main power house and boiler & mill bunker building with associated ladders/ stairs, grating, handrails etc.
3.1.49	Drinking water, distribution of construction power, development of pre-assembly yard, area lighting of pre-assembly area and boiler area, obtaining approval from statutory authority.
3.1.50	Garbage chute
3.1.51	Miscellaneous tanks (IBD/ CBD/ CC pump make up water tank/ clean drain flash tank for SCAPH drain, drain oil tank in boiler and FO pump house, air receiver tank for APH) etc.

3.1.52	Application of pourable insulation, refractory, fixing of insulation pins, related iron/ steel components, lagging of insulation mattresses, claddings over insulated surfaces etc.
3.1.53	Application of final painting over steel surfaces of boiler & aux. components (one coat of red oxide & two coats of final paints). Paints shall be taken from approved paint manufacturers & various colour codes will be decided by BHEL/Customer.
3.1.54	Hoist for ID, FD, PA, MILLS, CC pumps, APH bucket handling, SCAPH handling, FO pump house, ESP roof etc
3.2	PRESSURE PARTS
3.2.1	Installation of temporary structure for drum lifting is in the scope of the contractor's work the required steel for the purpose will be provided in random sizes by BHEL free of charge. These shall be fabricated to suit the requirement, erected and welded as part of work. NDT has to be carried out as per instructions. These structures have to be dismantled at appropriate stage and returned to BHEL as per the instructions of BHEL Engineer. Also, the relevant area of permanent structures has to be finished as instructed. Payment for above will be made at the rate accepted for structures (under NPP); no separate payment will be made for fabrication, dismantling and finishing work and return of materials.
3.2.2	Pressure parts components like headers, panels, coils, loose tubes etc. have to be flushed / blown with compressed air, checked for dimensional accuracy and configuration and minor rectifications, if necessary will have to be done before erection. This will involve making appropriate bed of steel structures over the concrete blocks. Steel, in random sizes, for this purpose will be provided by BHEL from the packing materials / scraps etc., where as necessary concrete blocks shall be arranged by the contractor. Bed shall be fabricated as per requirement. These shall be dismantled & returned to BHEL at appropriate stage. No separate payment for making / dismantling such bed is envisaged.
3.2.3	Normally the high-pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. No gas cutting will be permitted. All fittings like "T" pieces, weld neck flanges, reducers etc. shall be suitably matched with pipes for welding (this is applicable to piping work also).
3.2.4	Welding of all attachments on pressure parts including those required for insulation work is in the scope of work.
3.2.5	Furnace area and heat recovery area of flue gas passage has to be made leak proof by seal welding. Air leak test by pressurization has to be conducted to prove effectiveness of the seal weld and soap bubble, kerosine or any other similar test will have to be carried out for the entire seal welds to ascertain the effective sealing is achieved. The tests may have to be repeated till satisfactory result is achieved.
3.2.6	If required, the pressure parts, after initial erection and tests, will have to be preserved by either dry or wet preservation procedure. Contractor shall erect the piping & valves and provide necessary assistance for the same. Required piping, valves and preservative (gas / chemicals) will be provided by BHEL as free issue.
3.2.7	The drum internals, if already installed, may have to be removed to facilitate inspection by statutory authorities and chemical cleaning. The drum internals are to be preserved properly and refitted afterwards as part of work.
3.3	BOILER DRUM
3.3.1	For ODC consignments viz ceiling girders, mill base assembly, burner block, bottom ring header, air pre-heater centre sections and boiler drum, the quoted/ accepted rate are inclusive of this scope of works. The drum will be unloaded near boiler cavity by the contractor and BHEL shall provide cranes, free of cost, as required for unloading/ handling of boiler.

	Ceiling girders, mill base assembly, burner block, bottom ring headers, air pre-heater centre sections may also come in the way stated above. Unloading of ceiling girders, mill base assembly, burner block, bottom ring headers, air pre-heater centre sections is also in the scope of contractor.
3.3.2	Transportation by trailer, dragging on rails of drum from the point of delivery to the boiler cavity is contractor's scope. Collecting from stores / storage yard, transporting to & handling at site, laying the sleeper bed and rails, shifting etc. are contractor's responsibility. Contractor shall, if required, fabricate the saddle for dragging of drum to the boiler cavity as incidental to work. Structural materials required for the same will be provided by BHEL on free basis.
3.3.3	The drum has to be lifted and erected in position by contractor by strand Jack method and the contractor shall tie up with specilaised agency for lifting and placement of drum in position by Strand Jack method and submit plan, procedure along with credentials and test certificate of strands used by specialized agency for approval of BHEL.
3.3.4	Corrections in the profiles of scalloped plates/ bars, skin casing, seal plates etc. for proper matching with matting parts, wherever required, shall be done as incidental to the work.
3.3.5	Flame cutting of high-pressure piping and pressure parts shall not be permitted.
3.3.6	Extra portions of fins in water-wall panels has to be smooth ground for making panels to panel joints. Also panel to panel tube joint alignment may require some amount of fin cutting and edge preparation/adjustment of panel. Such works shall be carried out by the contractor to the desired accuracy as part of the scope of work complete penetration of water wall (panel to panel) fin welding shall be achieved either by single side or double side welding.
3.3.7	Panel to panel welding in water-wall panels shall be carried out by the contractor as part of the scope of work. This shall be carried out by approved high pressure welders only.
3.3.8	Attachment welding of necessary seal boxes inspection windows. Instrument tapping points, thermocouple pads, root valves, condensing valves, flow nozzles and control valves etc., both for regular measurement and performance testing to be provided on boiler, 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 instructions of BHEL Engineer. The erection and welding of all above items will be the contractor's responsibility, within their quoted rate.
3.3.9	The inside of all tubes, pipes, valves and fittings shall be free from dirt, and loose scales. Before being erected, all pipelines shall be thoroughly blown and/or flushed; the ball and sponge test shall be carried out. All the above works shall be carried out by the contractor as part of the scope of work. A system for recording all such operations shall be developed and maintained in a manner to ensure that no obstructions are left inside the tubes/pipes and no tubes/pipes are left non-cleaned and untested.
3.3.10	All attachment, welding, fixing hooks, supports, anchors, studs, plates, angles and other steel components to support insulation and refractory over the pressure parts components erected shall have to be carried out by the contractors as specified in the drawings and as per instructions of the engineer. Welding of supports shall be done by high pressure welders only.
3.4	TRIM & INTEGRAL PIPING OF BOILER (PG 21, 24 AND 80 (PART))
3.4.1	The work on various piping systems will include cutting to required length, edge preparation, laying, fixing & welding of the pipes/ elbows/ fittings/ valves etc in the pipeline, fixing & adjustment of supports/ anchors/ shock absorbers and carrying out all other activities/ work to complete the erection and also carrying out all pre-commissioning/ commissioning operations mentioned in the specification as per BHEL engineers instructions and/ or as per approved drawings/ documents.

3.4.2	Tubes or pipes wherever deemed convenient, will be sent in random lengths. These shall be cut and edge prepared to suit the site conditions and the layouts. Fittings like bends tees, elbows, reducers, flanges etc. will be supplied as loose items. However, bends of tube size up to Nb 65 mm will have to be formed at site as incidental to work.
3.4.3	All drains/ vents/ relief/ escape/ safety valve exhaust piping etc to various tanks/ sewage/ drain canal/ flash box/ sump/ atmosphere etc from the stubs on the piping and equipments are covered in the scope of work.
3.4.4	Connection (either flanged/ bolted or welded) of piping to the terminal points/ equipments etc is in the scope of work even though such terminal point/ equipment may not form part of this work. All NDE including radiography/UT with recording/ MPT/ DPT of joints so made, post-weld-heat-treatment if any, are also within the scope of work/ specification. The terminal points work is inclusive of cutting of existing lines, if required, edge preparation, welding/ blanking and hook up work.
3.4.5	It should be ensured that all the terminal point connections are done without transferring any undue load or strain to the other equipments. Necessary protocols have to be prepared for such fit-up along with BHEL / customer representative before connecting. All NDE including radiography of joints so made, post weld heat treatment if any, are also within the scope of work / specification.
3.4.6	Mechanical freeness of valves has to be ensured prior to erection.
3.4.7	The above provisions shall be applicable mutatis – mutandis, to other piping systems eg oil piping of rotating m/cs, ACW lines etc.
3.4.8	All drain points shall be laid by the contractor to the drain pit with necessary support as advised by BHEL engineer as part of the scope of work.
3.5	ROTATING MACHINERY
3.5.1	Specifications covered under the following paragraph and also other relevant specifications contained in other paragraphs elsewhere in this tender document will be applicable for rotating machines like FD/ ID/ PA/ seal air fans/ scanner fans, blowers, coal mills, fuel feeders, HP dosing pump skids and other similar auxiliaries.
3.5.2	All lubricants for testing, preservation and lubricants for trial runs of the equipments shall be supplied by BHEL as free issue. All services including labour shall be provided by the contractor for drawing these from BHEL / customer's stores, transporting, handling, filling, emptying, re-filling, accounting and return of surplus lubricants/ empty containers/ old & used lubricants after draining etc. Contractor should clean the spilled/ leaking lubricants thoroughly; consumables for such cleaning will be in contractor's scope.
3.5.3	All rotating machinery and equipments shall be cleaned, lubricated, checked for their smooth rotation, if necessary, by dismantling and re-fitting before erection. Also, the equipments may have to be checked for clearances, tolerances at any stage of the work including during testing, commissioning etc. Shaft of the rotating machines shall be rotated periodically to avoid damages.
3.5.4	Trial run of the drives in un-coupled state and then coupled with equipment has to be done after necessary alignment.
3.5.5	Forced lube oil systems including lube oil piping of drives, rotating equipments etc. form part of the work under these specifications. Hydraulic test of oil coolers, oil piping etc. are in the scope of work. Where required cooler may have to be dismantled for hydraulic test and re-erected thereafter as part of work.
3.5.6	Certain rotating machinery, after testing, pre-commissioning may have to be re-aligned/ hot aligned and vital clearances re-set. This may necessitate disconnection of cabling, removal of certain instruments etc and restoration thereafter.
3.5.7	Protective lubricant coats/ fill provided on/ in the critical area of equipments have to be removed at appropriate stage and regular lubricants, after removal/ cleaning of protective coat/ fill, as per specifications should be filled/ applied.

	Cleaning/ flushing agents/ oils will be provided by BHEL.
3.5.8	Chemical cleaning, steam blowing and air drying of the connecting pipes for the lube oil system has to be carried out wherever required as per instruction manuals/ drawings. Chemicals will be provided by BHEL
3.5.9	Even though rotating machines may be grouted to foundation using non-shrink grout mix, blue matching of packer plates/ shims with foundation/ between packers/ equipment base should be done as incidental to work.
3.5.10	Skid mounted equipments may need checking, re-setting due to various reasons as incidental to work.
3.5.11	All the shafts of rotating equipment shall be properly aligned to those of the matching equipments to as perfect an accuracy as practicable. The equipment shall be free from excessive vibration so as to avoid overheating of bearings or other conditions which may tend to shorten the life of the equipment. The vibration level of rotating equipments measured at bearing housing shall not exceed forty (40) microns and shall conform to VDI 2056.All bearings, shafts and other rotating parts shall be thoroughly cleaned and suitably lubricated before starting.
3.6	MAIN SUPPORTING STRUCTURES, EXTERNAL STRUCTURES, STAIRWAYS, GALLERIES & PLATFORMS & HANDLING ARRANGEMENT
3.6.1	Boiler main supporting structures have to be erected in a sequential manner.
3.6.2	Quality norms with regard to vertically of column, inter-alia, have to be adhered to strictly, at various stages of erection.
3.6.3	Stiffening/ strengthening of main supporting structure, if any, due to deviation in verticality of columns post drum lifting, shall be carried out by the contractor. Necessary steel for this will be provided by BHEL as free issue. Payment for such stiffening/ strengthening shall be made for weight certified by BHEL engineer at the item rate applicable to structures, provided the deviation has occurred for the reasons not attributable to the contractor.
3.6.4	Each of the ceiling girders will be sent in 3 pieces and will have to be assembled, welded and NDE & PWHT (SR) done on ground prior to their erection in position.
3.6.5	It is likely that in deviation from prescribed sequence, erection of certain elements of structure may be deferred for later stage, to facilitate, say crane boom reach to higher elevation, passage of drum during drum lifting etc. This may necessitate temporary installation of some structural steels at appropriate locations to keep the stability of structure intact. Such temporary installation shall be removed subsequently and returned permanent structures shall be done as per the instruction of BHEL Engineer. BHEL will provide necessary steels on free issue basis in random sizes for such installations, which shall be fabricated by the contractor to suit the requirement.
3.6.6	Payment for such installations shall be made on the accepted tonnage rate of structures. No separate payment will be made for fabrication, removal & return of the materials to BHEL stores.
3.6.7	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, 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.
3.6.8	Temporary cat ladders & working platforms during erection of columns, platforms and other structural components. Such arrangements shall be only of clamping & bolting type as welded on columns etc. will not be permitted. After the completion of work these shall be removed. Contractor shall arrange materials required for arrangements as above.
3.6.9	All the handrails and toe guards shall be provided as per drawings and site requirement. Handrails supplied in running lengths shall be suitably cut, edge prepared and welded. Also, hand rails / guard 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 handrails shall be ground to flush finish.
3.6.10	Additional platforms of permanent nature for approaching different equipment as per the site requirement, though not indicated in drawings, shall also be installed by the contractor. 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 applicable item rate of price schedule.
3.6.11	All relevant provisions as above shall apply to work of external structures, interconnecting structures & equipment handling system.
3.6.12	The contractor shall carry out burner alignment and burner nozzle setting as directed by BHEL engineer. Burner tilt mechanism will be checked for freeness, serviced and adjusted, if necessary to obtain optimum tilt before and after installation for which all necessary arrangement for providing safe approach inside the furnace has to be taken care of by the bidder.
3.6.13	HSFG bolts of boiler supporting structure are to be tightened, by turn of nut method, as per the instructions of BHEL Engineer. The bolted joints should be jointly checked by the BHEL/ customer and contractor's personnel for the required tightness and re-tightened wherever necessary. The tightened bolts should be identified by colour paints. Facility for random checking with calibrated torque wrenches shall also be provided by contractor.
3.7	OTHER PRODUCTS AND SYSTEMS
3.7.1	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. 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.
3.7.2	Certain structural items like silencer supports, roof cladding structure, platform etc. will be supplied in running lengths which shall be cut to required suitable sizes and adjusted / trimmed as part of work.
3.7.3	Contractor has to make canopies for motors, actuators, lub oil units, control valves etc. Material for this will be supplied in random lengths/ sizes. No separate payment for fabrication is envisaged. Payment only for erected weight as certified by BHEL engineer shall be made at the applicable item rate of price schedule.
3.7.4	ID fans are provided with variable frequency drives. Contractor has to erect & commission only the motor and other mechanical components like coupling etc. Panels, transformers, cabling etc. are not in this work specification.
3.7.5	Fine fittings, boiler drain piping, oil system & other small bore piping have to be routed according to site conditions and hence shall be done only in position. As such, layout of small bore piping in boiler and oil system including bending, cutting edge preparation etc. shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of change in routing the above pipelines even after completion, to suit the site condition which shall have to be done by the contractor at no extra cost. On completion of piping, erection contractor should submit `As-built' drawings with RTF for necessary record.
3.7.6	Oil system main lines supports shall be supplied at random lengths and fabrication, erection etc of these supports shall be included in the scope of the contractor within the quoted rates.
3.7.7	The air heater baskets have to be thoroughly cleaned by compressed air and preservative to be spread as part of responsibility of the contractor.
3.8	PREPARATION OF FOUNDATIONS, AND GROUTING OF EQUIPMENTS OF BOILER & AUXILIARIES.
3.8.1	Building foundations and other necessary civil works for supporting structures, equipments etc. will be provided by BHEL/ customer. The dimensional

	accuracy, axes, elevation, levels etc. with reference to benchmarks of foundations and anchor blot 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.
3.8.2	Minor adjustments of foundation level dressing and chipping of foundation surfaces and blue-matching (wherever required) for all equipments as per BHEL engineer's instructions, should be done by the contractor as part of the work. Dressing and chipping of foundations to the extent of 30 mm for achieving proper levels is within the scope of work.
3.8.3	All temporary foundations and anchor points required for installing erection equipments and winches etc. are in the scope of contractor. All building materials like cement, steel 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.
3.8.4	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.
3.8.5	BHEL will provide free of cost only the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates/ steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting/ chiseling/ grinding and de-burr the same. However, machining of the packers wherever necessary will be arranged by BHEL.
3.8.6	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 (eg srinkcomp, conbextra etc), form work, shuttering, and any other requirements is in the contractor's scope. Contractor shall obtain approval of BHEL for cement (ordinary 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.
3.8.7	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.
3.8.8	Foundation and other necessary civil works for supporting structures, equipment etc, will be provided by BHEL/ customer. The dimensions of the foundation and anchor bolt pits shall be checked by contractor for their correctness with respect to the above access as per the erection drawings. Further, top elevation column foundations shall be checked with respect to bench-mark etc. All minor adjustment of foundation levels dressing and chipping of foundation surfaces etc upto 30 mm as may be required for the erection of equipment/ plants will be carried out by the contractor without any extra cost. All foundations and anchor points required for installing winch, shall be cast by the contractor using his own materials at his cost. Installation of starters, distribution etc, shall be done by the contractor while only incoming supply to the common isolating switch will be arranged by BHEL. Grouting of

	all columns, equipment base plates, anchor bolt holes etc are included in the scope. The grouting mixture shall be either composed of port land cement or ready mix grout of proved quality. However, in both the cases contractor will supply portland cement and ready mix grout component respectively. Application of the two options will depend on drawing/ specification/ instruction of BHEL engineer. The contractor shall arrange for sand, stone chips, gravels, anti shrink compound, plasticizer, shuttering, grout mixing machine, labours etc at his cost. The contractor shall prepare the required test pieces/ test cubes to ensure the strength of grout and get the same tested in laboratory at his cost. Test cube shall also be taken during grouting for testing in the laboratory and shall be tested at his cost.
3.8.9	The grout shall be high strength grout having a minimum characteristic compressive strength of 60 N/mm2 at 28 days. The grout shall be chloride - free, cement based, free flowing, non-metallic grout.
3.8.10	The grout shall have good flowability even at very low water/ grout powder ratio.
3.8.11	The Grout shall have characteristics of controlled expansion to be able to occupy its original volume to fill the voids and to compensate for shrinkage. Grout shall be of pre-mix variety so that only water needs to be added before use.
3.8.12	The mixing of the Grout shall conform to the recommendations of the manufacturer of the Grout.
3.8.13	After the base has been prepared, its alignment and level has been checked and approved and before actually placing the grout, a low dam shall be set around the base at a distance that will permit pouring and manipulation of the grout. The height of such dam shall be at least 25mm above the bottom of the base. Suitable size and number of chains shall be introduced under the base before placing the grout, so that such chains can be moved back & forth to push the grout into every part of the space under the base.
3.8.14	The grout shall be poured either through grout holes if provided or shall be poured at one side or at two adjacent sides to make the grout move in a solid mass under the base and out in the opposite side. Pouring shall be continued until the entire space below the base is thoroughly filled and the grout stands at least 25 mm higher all around than the bottom of the base. Enough care should be taken to avoid any air or water pockets beneath the bases.
3.8.15	In addition to the above, recommendations of Grout manufacturer shall also be followed.
3.8.16	The poured grout should be allowed to stand undisturbed until it is well set. Immediately thereafter, the dam shall be removed and grout which extends beyond the edges of the structural or equipment base plates shall be cut off, flushed and removed. The edges of the grout shall then be pointed and finished with 1:2 cement mortar pressed firmly to bond with the body of the grout and smoothened with a tool to present a smooth vertical surface. The work shall be done in a clean and scientific manner and the adjacent floor spaces, exposed edges of the foundations, and structural steel and equipment base plates shall be thoroughly cleaned of any spillage of the grout.
3.8.17	After the grout is set and cured, the Contractor shall check and verify the alignment of equipments, alignment of shafts of rotating machinery, the slopes of all bearing pedestals, centering of rotors with respect to their sealing bores, couplings, etc. as applicable and the like items to ensure that no displacement had taken place during grouting. The values recorded prior to grouting shall be used during such post grouting check- up and verifications. Such pre and post grout records of alignment details shall be maintained by the Contractor in a manner acceptable to the BHEL/ employer.
3.9	WELDING, RADIOGRAPHY AND OTHR NON-DESTRUCTIVE TESTING, POST WELD HEAT TREATMENT
3.9.1	Installation of equipment involves good quality welding, NDE checks, post weld heat treatment etc. Contractor's personnel engaged should have adequate

	qualification on the above works. Qualified minimum 2 nos. NDT Engineers are to be deployed at site with ASTM/ISMT level II certification in RT, UT, LPT, MPI.
3.9.2	The method of welding (viz) arc,TIG or other method will be indicated in the detailed drawing / documents. BHEL Engineer will have the option of changing the method of welding as per site requirement.
3.9.3	All welders shall be tested and approved by BHEL Engineer before they are actually engaged on the work even though they may posses the requisite certificates. BHEL reserves the right to reject any welder without assigning any reasons. The welder identification code as approved by the BHEL Engineer shall be stamped by the welder on each joint done by them. Suitable recording shall be made available by the contractor to identify which joint has been welded by which welder. The contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by BHEL/statutory body /customer.
3.9.4	All welded joints shall be subjected to acceptance by BHEL engineer/ statutory body/ customers. Joints coming under the purview of IBR need to be cleared by testing laboratory of Boiler Directorate. Contractor has to arrange for such regular evaluation of radiographs without accumulation of any backlog. Necessary evaluation fees only will be paid by BHEL/ customer in this regard. Repair work and re-sampling also shall be taken up promptly, without piling any backlogs.
3.9.5	Welding of high-pressure joints shall be done by IBR certified high-pressure welders who have been permitted by CIB of state concerned for deployment at the site of work after conducting simulation tests in presence of representative of boiler directorate.
3.9.6	Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved attachment welders only.
3.9.7	All the welders (structural and high pressure) shall be tested and approved by BHEL engineer before they are actually engaged on work though they may possess the IBR/ other certificate. BHEL reserves the right to reject any welder without assigning any reason. Pipe & tubes for simulation test of HP welders shall be supplied by BHEL free of cost as per supplied quantities of BHEL units. However, for revalidation test of these welders as well as non-IBR welders, the required pipe/ tube/ plate is to be arranged by the contractor.
3.9.8	Unsatisfactory and continuous poor performance may result in discontinuation of concerned welder.
3.9.9	The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this consumables like paint / primer etc. will be in the contractor's scope.
3.9.10	HP joint fit-ups, should be protected, where required, by use of tapes / protective paint as may be prescribed by BHEL. The contractor shall supply consumables like protective paints / tapes etc.
3.9.11	The contractor shall maintain welding records in the form as prescribed by BHEL containing all necessary details, and submit the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability of the welds shall be final.
3.9.12	In execution of this work, considerable number of socket weld joints is involved. The exact quantity of such socket welds or probable variation in the quantum cannot be furnished. The tenderer shall take notice of this while quoting, as no extra claim on this account will be entertained at a later date. The socket welding on HP parts/ HP piping shall be done by the IBR qualified welders. In case the contract provides for payment / recovery on account of variation in the quantity of butt weld joints. Modification work, involving socket weld joints will be paid on the basis of extra man-hour rate only. Contractor has to adhere to the procedures/ specification as indicated in the drawing for socket welding.
3.9.13	All butt joints of high pressure tubular system of boiler and piping shall be carried out by TIG root-run and subsequent runs by arc welding. Full TIG

	welding, wherever necessary shall be carried out within the quoted rates. For oil system piping, root run of all the butt joints shall be carried out by TIG welding only. While all the filler wires required for TIG welding of boiler tubular joints will be supplied by BHEL free of cost, Filler wires required for the piping works to be arranged by the Contractor within his quoted price.
3.9.14	Contractor shall provide all resources and make all arrangements for the radiographic examination of welds for this work. For reasons of safety, invariably the radiography work will be carried out after the normal working hours and close of other site activities only.
3.9.15	Radiography inspection of welds shall be performed in accordance with requirements and recommendation of BHEL Engineer. The quantum of radiographic inspection shall be as per provision of IBR / BHEL's Erection Welding Schedule (EWS). They may, however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer / boiler inspecting authority.
3.9.16	All X-ray / gamma ray films of weld joints shall be preserved properly and be handed over to BHEL / IBR authorities and requisite clearances shall be obtained by the contractor. The contractor shall be fully equipped with radiography equipment, films, chemicals and other dark room facility. There must be a number of radio-graphic 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. For preliminary evaluation of radiographic films, the contractor must deploy competent personnel having at least ASNT / ISNT Level-II certification. He should also ensure compliance of all statutory requirement with respect to health hazard in handling the radiographic sources. The contractor shall also furnish along with their offer, the names of approved high pressure welders in TIG welding and alloy steel arc welding.
3.9.17	Test facilities shall be established / sourced expeditiously and testing shall be conducted regularly ensuring that no backlogs are piled up. If the contractor does not carry out radiography work in time due to non-availability of film, chemicals, etc, BHEL may get the work done through some other agency at the risk and cost of the contractor.
3.9.18	The field welded joints shall be subject to dye-penetrant / other non-destructive examination as specified in the respective engineering documents/ as instructed by BHEL.
3.9.19	Where required, surface preparation, like smooth grinding of welded area, prior to radiography shall be done. 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 these into account in his offer.
3.9.20	Pre-heating, 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. Radiography/ ultrasonic testing / Stress relieving contractors may be deployed at site after obtaining concurrence from BHEL site/IBR authority. Normally the electric resistance heating method will be adopted. Contractor shall arrange to supply heating equipment with automatic recording devices. Also, the contractor shall have to arrange for labour, all heating elements, thermocouples and attachment units, graph sheets, non contact thermometers, thermal chalks & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc. required for all heating and stress relieving works. For main steam line upto boiler stop valve, induction heating machine has to be used for the above purpose.
3.9.21	During preheat/stress relieving operations, the temperature shall be measured at one or more than one points as required by attaching thermocouples and recorded on a continuous printing type recorder. All the recorded graphs for

	the heat treatment works carried out shall be got signed by the BHEL Engineer prior to the commencement of each cycle and handed over to BHEL on completion. The graphs will be the property of BHEL. The contractor has to provide thermal chalks, non contact thermometers, temperature recorders, thermocouple attachment units, graph sheets, etc., required for the job and maintain them in good condition. All temperature recorders should be calibrated by approved agency of BHEL/ respective state Boiler Directorate, before use and validity renewed at appropriate intervals, Required fees to be paid for initial and periodic calibrations should be borne by the contractor.
3.9.22	Heat treatment may be required to be carried out at any time (day and night) to ensure the continuity of the process. The contractor shall make all arrangements including labour required for the work as per direction of BHEL. For post weld heat treatment of main steam piping, the induction heating process shall continue un-interrupted. Therefore, contractor shall arrange DG set for the same to take care of power failures.
3.9.23	Methodology for sampling for testing of repaired weld joints is given below.
3.9.24	Whenever the quantum of check in any NDT is less than 100 %, guidelines for sampling / resampling procedure for NDT as formulated by BHEL will prevail including the following features :
3.9.25	The group of welds for sampling shall be based on welding done by welder in specified continuous time (say work done in a shift or in a day). For further analysis, acceptance or rejection, this group shall be treated as an entity.
3.9.26	From above weld group, the selection of weld joint / weld spot shall be done by BHEL/ customer as per the quantum of check specified.
3.9.27	For acceptance of the weld group, all samples selected in this group should meet the acceptance norms. In case of any sample(s) found not meeting acceptance norms, following actions shall be taken :
3.9.28	Rectification of defective welds and re-testing of the repair.
3.9.29	Re-sampling by BHEL/ customer from the same group of welds, with quantum of NDT being double of originally specified quantum (with minimum 2 welds for every defective weld).
3.9.30	In case of any weld from the re-sample, as per above found not meeting acceptable norms, following action shall be taken :
3.9.31	NDT of all the welds of the group, which were not tested in first and second samples. Repair and re-testing of all defective welds. Necessary action on process control and on welder for eliminating recurrence of defects.
3.9.32	For the purpose of sampling, the weld group shall be defined as number of welds in case of smaller diameter of tubes/ pipes (or small welds on structures) while for very large diameter pipes eg CW piping or for vessels/ long welds, the length of weld may be taken as basic unit. Sampling shall also be accordingly in terms of no. of weld joints or length of weld.
3.9.33	From the time of readiness of weld group, suitable time limits shall be prescribed for first sampling testing, re-sampling, repairing, re-testing etc. (normally not more than 1 day's backlog should be piled up at every step).
3.9.34	Illustration : Radiography of welds : welding completed on day-1 should be tested by day-2 and repair and re-sampling of the group should be done by day-3 and further testing / repair should be by day-4.
3.9.35	Sampling and re-sampling procedure shall be applicable for all the NDT viz RT, UT, DPT, MPI.
3.9.36	Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radio-graphed and new films submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out 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-radiographed at Contractor's cost. The evaluation charges in respect of such repeated evaluation shall have to be borne by the contractor.
3.9.37	Results of these processes shall be verified / validated as per requirements of

	BHEL / client.
3.9.38	Welding electrodes have to be stored in enclosures having temperature and humidity control arrangements. A separate Electrode storage room alongwith dehumidifier with humidity indicator in the room shall be provided for storing all kinds of electrodes. This enclosure shall meet BHEL specifications.
3.9.39	Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens.
3.9.40	One air conditioned dark room and pit for radiography source of 2 nos. as per BARC standard is to be provided at site.
3.10	TESTING, PRE-COMMISSIONING AND COMMISSIONING
3.10.1	Testing, pre-commissioning & commissioning will involve, though not limited to these, various testing eg hydro-static pressure, pressure decay tests, leak test, trial run of equipments; flushing by air, water, oil or steam as applicable; checking/ setting various clearances/ parameters, ensuring operation of various equipments free of undue restrictions, Boiler light up, chemical cleaning & boil out of boiler, steam blowing of the boiler, floating of safety valves, coal firing, trial operation and loading etc. are some of these activities. All the activities for commissioning of the set, as informed by BHEL from time to time shall be completed.
3.10.2	The contractor shall carry out the required tests up to the battery limit on the boiler and pipelines such as hydrostatic test of the main boiler, gas tightness test for ducts by kerosene or smoke bombs methods, hydrostatic test of pipelines, furnace pressure tightness test/ air leak test etc. It may be required to do the gas tightness test of ducting and boiler furnace by filling up air and pressurising with the help of compressor/ fan. All the above tests shall be repeated till the successful completion of tests is certified by BHEL as a part of the work.
3.10.3	Contractor shall lay all necessary temporary piping with valves, pressure gauges, blank plate supports at the duct & pipes terminals etc and install the pumps required for the test. After the test all the temporary piping, pumps etc will be removed and returned to BHEL stores.
3.10.4	All the above tests should be repeated till all equipments satisfy requirement/ obligations of BHEL to their client and also the relevant statutory authority.
3.10.5	Contractor shall lay/ install necessary temporary piping, pumps, valves, blanks, gauges, cables, switches etc for conduct of hydraulic/ pressure test, chemical cleaning, steam/ air blowing etc. This may involve cutting of some portion of existing piping/ valves, placing of rubber wedges/ blanks in the valves and other openings, fabrication and installation of temporary tanks for chemical mixing, temporary access platforms to mixing tanks etc. where required, bends have to be fabricated / formed at site from random length/ size of pipes/ structural steel. Temporary installation itself has to be tested, tried and subject to non-destructive examinations as per the instructions of BHEL as part of work.
3.10.6	For the purpose of payment various equipments/ items of temporary system for chemical cleaning/ alkali boil out/ steam blowing will be categorized as under.
3.10.6.1	Detaills indicated in relevant annexure (weight schedule).
3.10.6.2	No payment will be made for temporary installations made for hydraulic testing of various systems.
3.10.7	All materials, equipments 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. Moreover the electrical distribution network, cables and accessories required for commissioning of the chemical cleaning pumps to be arranged by the contractor at his cost.
3.10.8	Tank required for pouring and mixing the chemicals need to be fabricated by the contractor within his quoted rate. The tank size will be communicated

	before fabrication at site and required plate for fabrication of the tank will be supplied by BHEL free of charge on returnable basis. Similarly the steel required for supporting the tank will be supplied free of charge on returnable basis. Payment against erection will be paid under NPP. Contractor to take special note of the fact that no charges towards fabrication and supporting of the tank will be paid by BHEL and the same need to be executed within the quoted/ accepted rate.
3.10.9	Fabrication, fit-up, pre-heating, welding and post-weld-heat treatment if any, of requisite blanks for conduct of hydraulic test/ leakage test is part of work. Similarly, removal of blanks, restoration and normalization of the concerned system / line is to be done as part of work. BHEL will provide the material for blanks free of charge. No separate payment is envisaged for these activities.
3.10.10	Over hauling, cleaning, servicing of tanks, pumps, equipments, valves, during erection and commissioning stages are in the scope of work. Gaskets, packing & spares for replacement will be provided free of charges by BHEL.
3.10.11	After chemical cleaning / pickling of lubricating system (including oil piping, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems as per instructions of BHEL Engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machinery before and after oil flushing is in the scope of work.
3.10.12	Transportation of oil drums from customer's/ BHEL's stores, filling of oil for flushing, first fill of lubricants and subsequent topping up during trials, tests and 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, for various pre-commissioning/ commissioning activities/ processes mentioned in various clauses, transport of chemicals into the system and returning of remaining chemicals and the empty containers of the chemicals to customer/ BHEL stores is the responsibility of the contractor.
3.10.13	During trials/ tests, pre-commissioning/ commissioning, replacing/ changing mechanical/ other seals of equipments like pumps, removal and cleaning / replacing of filters etc is within the scope of work. Replacement spares for this purpose will be provided by BHEL.
3.10.14	In case any defect is noticed during tests, trial runs of all equipments and their auxiliaries, such as interferences, rubbing, loose components, abnormal noise or vibration, strain on connected equipment etc, contractor shall immediately attend to these defects and take necessary corrective measures. If any re-adjustment and re-alignment are necessary, the same shall be done as per BHEL engineer's instructions. Claim, if any, for these works shall be governed by Section 13 provided the cause of such work is nor attributable to the contractor.
3.10.15	Contractor shall cut/ open/ dismantling work, if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.
3.10.16	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 job expeditiously and promptly and make food the job after completion of work by other contractors/ agencies of BHEL/ customers instruction. Claims, if any, in this regard shall be governed as per relevant section/clause.
3.10.17	During this period, though BHEL/ client's staff will also be associated in the work, the contractor's responsibility will be to arrange for complete requirement of men and required tools and plants, consumables, scaffolding and approaches etc till such time the commissioned unit undergoes trial operations.
3.10.18	Commissioning activities will continue till the completion of trial operation. During this period contractor shall make available the services of separate dedicated workforce comprising of suitable skilled and semi-skilled/ un-skilled workmen and supervisory staff along with necessary tools and plants, consumables etc.

3.10.19	It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning and commissioning period along with BHEL Engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.
3.10.20	At various stages of completion boiler has to be preserved against corrosion either by wet The contractor shall carry out any other tests as desired by BHEL engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or whole of work performed by the contractor.
3.10.21	Preservation or by dry preservation as per the requirement of BHEL engineer. Contractor shall carry out all the incidental jobs like filling up of water, dozing of chemicals and pressurizing the system to the required pressure, change of gas refills etc. The boilers have a permanent N_2 blanketing arrangement.
3.10.22	Chemical cleaning will involve cutting of some of the existing valves, placing the rubber wedges in the boiler drum, and cutting of hand-hole plugs of bottom ring header. Boiler drum internals also shall be removed before chemical cleaning within the quoted price.
3.10.23	Re-welding of the hand-hole plugs and the valves which were cut, re-fixing of boiler drum internals etc after completion of chemical cleaning shall be done by the contractor at his cost.
3.10.24	It shall be specifically noted that the above employees of the contractor may have to work round the clock along with BHEL commissioning Engineers and hence over time payment may be involved. The contractor's quoted rate shall be inclusive of all these factors also.
3.10.25	Performance of guarantee test: The final performance and guarantee tests of the unit (s) to establish the guaranteed parameters shall be carried out by BHEL. Contractor shall assist BHEL by providing required manpower, tools and consumables for carrying out the above tests. All preparatory works and temporary connections required for performing the above tests shall be carried out by the contractor free of cost.
3.10.26	The instruments required for conducting PG test shall be provided by BHEL free of charges and the contractor has to provide manpower assistance and other necessary inputs like scaffolding, hand tools & related consumables etc. for the same with a deployment of about fifty man-months approximately.
3.10.27	Supply and application of touch up painting, preservative painting and final painting is in the scope of contractor.
3.11	ELECTROSTATIC PRECIPITATOR
3.11.1	SCOPE OF WORK
3.11.1.1	The work to be carried out under the scope of this specification covers the complete work of handling including receipt from stores/yard, arranging their issue, site transportation, temporary storage prior to erection, if required, cleaning, preservative painting, erection, alignment, welding, leveling, adjustment, chipping & leveling of foundation, welding of hooks, plates etc., gas distribution test, gas tightness test, all pre-commissioning tests, start-up and trial run of individual equipment, final commissioning, and trial run of individual equipments, trial run of total ESP etc for 500 MW units up to handing over of the unit to BHEL/ their customer including PG test of the unit. The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during erection. If any portion of works is found to be defective in workmanship not conforming to drawings/ documents or other stipulations, the contractor shall dismantle and re-do the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
3.11.1.2	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.

3.11.1.3	No deviation in scope of work, whatsoever, shall be allowed by BHEL.
3.11.1.4	The work to be carried out under this scope covers the complete work of Electrostatic Precipitator (ESP) of customer, housed in four nos of independent casings including outside shell, structural steel support and frame work, access ladders, platforms, safety rails, stairways, walk ways, access doors and weather proof pent house. Transformer handling system at roof etc.
3.11.1.5	The work to be carried out under the scope of this specification shall broadly comprise of but not to be limited to the following:
3.11.1.6	Foundation and other necessary civil works for supporting structures, equipment etc, will be provided by BHEL. The dimensions of the foundation and anchor bolt pits shall be checked by contractor for their correctness with respect to the above access as per the erection drawings. Further, top elevation column foundations shall be checked with respect to bench-mark etc. All minor adjustment of foundation levels dressing and chipping of foundation surfaces etc. upto 50 mm as may be required for the erection of equipment/ plants will be carried out by the contractor at no extra cost. Grouting of all columns, equipment base plates, anchor bolt holes etc are included in the scope. The foundation pockets shall be cleaned by using compressed air. The grouting mixture shall be either composed of portland cement or ready mix grout of proved quality. However, in both the cases the contractor has to arrange portland cement and ready mix grout component respectively within the included cost and no payment shall be released by BHEL to the contractor on this account. Before arranging the type of cements/grouting materials, the contractor must take approval from BHEL/ customer for the brand to be used. Application of the two options will depend on drawing/specification/ instruction of BHEL Engineer. The contractor shall arrange for sand, stone chips, gravels, anti shrink compound, plasticizer, shuttering, grout mixing machine, labours etc at his cost. The contractor shall prepare the required test pieces/ test cubes to ensure the strength of grout and get the same shall be tested in laboratory at his cost. Test cube shall also be taken during grouting for testing in the laboratory and shall be tested at his cost. Necessary arrangements along with watering till complete curing has to be arranged by the contractor.
3.11.1.7	The contractor shall take delivery of material/ equipment at projects store/ yard. As soon as the material is issued to the contractor, all responsibility of proper handling and storage shall be the responsibility of the contractor and thereafter any loss/ damage to the equipment and material due to faulty handling and storage or any other reason attributable to contractor, shall be made good by the contractor at his own cost.
3.11.1.8	The contractor shall check, tally and inspect all material consignment issued to him and shall maintain proper record of the receipt of material received and such reports shall be produced by the contractor to the Engineer for verification. Any deviation from packing list or damage to any component noticed during receipt of material should be immediately brought to the notice of BHEL engineer. Any claim in this regard after receipt of material by the contractor will not be entertained.
3.11.1.9	Pre-assembly of equipment to be done at the pre-assembly yard for inspection and checking. It is to be noted that BHEL will provide only reasonably leveled open space for pre-assembly yard. The contractor has to arrange desired leveling of the area at their cost. The fixtures, steel structures required for temporary supporting for pre-assembly, checking, and welding for lifting and handling during pre-assembly and erection shall be arranged by the contractor at his own cost. Steel for such work if required shall be arranged by contractor.
3.11.1.10	All the works such as cleaning, touch up painting, checking, aligning, assembling, temporary erection for alignment, dismantling of certain equipment for checking and cleaning, surface preparation, grinding, straightening, chamfering filing, chipping, drilling, reaming, rapping, shaping, filling up etc and other works, as may be applicable in such erection works which are treated as incidental to the erection works and are necessary to

	complete the work satisfactorily, shall be carried out by the contractor as part of the work. All consumables including Paints for touch up painting, as required, shall have to be supplied by the contractor at his cost.
3.11.1.11	The contractor shall fabricate and install as part of the work, all platforms ladders, and approaches wherever required for facility of operation of equipment/ instrument wherever required but not specifically shown in the drawings/bill of materials. However raw materials for the same shall be provided by BHEL.
3.11.1.12	Attachment welding of necessary seal boxes inspection windows. Instrument tapping points, etc, both for regular measurement and performance testing to be provided on ESP, covered within the 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 the contractor's responsibility, within their quoted rate even if:
3.11.1.12.1	Product groups (PG) under which these items are released are not covered in the scope of this tender.
3.11.1.12.2	Items are supplied by an agency other than BHEL.
3.11.1.13	Fabrication of supports wherever required, shall also be carried out by the contractor without any extra cost. Any additional support if required for effective completion of work, as advised by BHEL engineer, shall be fabricated and erected by the contractor at no extra cost. However, the raw material required for such additional supports shall be supplied by BHEL.
3.11.1.14	All rotating machinaries and equipment under the scope shall be cleaned, lubricated, checked for their smooth rotation if necessary by dismantling and refitting before erection. If, in the opinion of the BHEL Engineer, the equipment is to be checked for clearances, tolerances at any stage of the work or during commissioning period, facilities for dismantling, cleaning, lubricating and refitting shall be provided by the contractor. All consumables required shall be supplied by the contractor at no extra cost.
3.11.1.15	All attachment, welding, fixing hooks, supports, anchors, studs, plates, angles and other steel components to support inner roof insulation only shall have to be carried out by the contractors as specified in the drawings and as per instructions of the engineer. Welding of supports shall be done by Qualified HT welders only.
3.11.1.16	In case of any class of work for which there is no such specification as laid down in the contract, such as welding of stainless steel parts such work shall be carried out including supply of consumables in accordance with the instructions and requirements of the Engineer at no extra cost.
3.11.1.17	All lifting tackles including wire-ropes slings, shackles, used by the contractor, shall be got approved by BHEL Engineer. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damages to other equipment and personnel. Test certificates and periodical calibration of lifting appliances from a recognised body are to be submitted to BHEL site office, as per requirement of BHEL/ISO system. Expenditure on such works forms a part of the scope of work.
3.11.1.18	The contractor shall erect scaffoldings/Temporary platforms supports etc required during erection before the permanent supports are erected. These should be of adequate capacity and shall never be overloaded. These should be replaced when not found suitable during erection work. All structure materials required for the above shall be arranged by the contractor at his own cost. No such material shall be supplied by BHEL in any case. Welding of temporary supports, cleats etc. on the columns shall be avoided. In case of absolute necessity, contractor shall take prior approval from BHEL Engineer. Further, any cutting or alteration of member of the structure or platform or other equipment shall not be done without specific prior, approval of BHEL Engineer.
3.11.1.19	Proper account of the packing wood and steel supports forming part of packing will be kept by the contractor and returned to BHEL stores from time to time.
3.11.1.20	Temporary blanking /restoration of ESP inlet / outlet and hopper flanges for

	commissioning , if required , has to be done by contractor free of cost. Further to above, any contingency arrangements required to carry out commissioning work is included as normal scope of work. This type of jobs include removal of temporary arrangements and restoration with the normal items on a later date is treated as normal scope of work. No additional payment shall be given by BHEL to the contractor on this account.
3.11.1.21	Non specified jobs at the interface / terminal points like bolting welding, gasket changing etc. have to be done by the contractor within the quoted price.
3.11.1.22	Instrument tapping coming on the ESP to be welded/ fitted by the contractor within the quoted price.
3.11.1.23	ESP collecting electrode may require straightening and repair due to minor transportation damage before erection and spot heating in position to get correct alignment. Contractor shall carry out this within his quoted rate.
3.11.1.24	Layer of insulation mattress on roof top of ESP (inner roof) shall be applied before outer roof is placed.
3.11.1.25	Fixing of deflection plates in the inlet screen sheet of ESP as per flow model report drawing. However, adjustment / re-positioning of the plates may be required to be done by the contractor during gas distribution test within the quoted rate.
3.11.1.26	All the collecting and emitting electrode suspension frames are to be checked in dimension and pitches before erection. All the readings are to be logged. Straightening of frames distorted during transportation shall be carried out by the contractor within quoted price.
3.11.1.27	Erection of electrical equipment like high voltage rectifier transformer, heating elements, rapping gear motor etc. are included in the scope of the contractor. Filtration of the Transformer oil is excluded from the scope of contract. Laying of cables, cable trays, termination of cables, glanding of control panels etc. are excluded from the scope of the contract.
3.11.1.28	Removal of all temporary supports, foreign materials, scraps, debris etc. from inside of the ESP and other erected components and thorough cleaning to achieve clearance / IR values between collecting and emitting system shall be done by the contractor.
3.11.1.29	For all plate welding, seal welding from inside and stich welding from other side is to be followed as per drawing.
3.11.1.30	Roof top sheeting & side cladding over ESP pent house to be done by the contractor within his quoted price. Required corrugated sheets and fixing hardwares will be supplied by BHEL under regular supply. Minor consumables like bitumen washers, putty etc. need to be arranged by the contractor within his quoted price.
3.11.1.31	Minor straightening of plates of inner / outer roof, funnels, GD screen sheets, hopper panels damaged during transportation shall be carried out by the contractor within his quoted rate.
3.11.1.32	The terminal points decided by BHEL should be final & binding on contractor for deciding the scope of work and effecting payment for the work done.
3.11.1.33	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of BHEL, BHEL's customer, customer's consultants and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.
3.11.1.34	All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory / local authorities are to be arranged by the contractor at his cost in time to ensure smooth progress of work.
3.11.1.35	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.
3.11.1.36	All cranes, 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 the contractor unless otherwise specified in the relevant clauses. The contractor's quoted rates should be inclusive of all such contingencies.
3.11.1.37	During the course of erection, testing and commissioning certain rework/ modification/ rectification/ repair/ fabrication etc may become necessary on account of feedback/ revision of drawing. This will also include modifications/ re-works suggested by BHEL/ customer/ other inspection group. Contractor shall carry out such rework/ modification/ rectification/ fabrication/ repair etc promptly and expeditiously. Daily log sheets signed by BHEL Engineer and indicating the details of work carried out, man-hours etc. shall be maintained by the contractor for such reworks.
3.11.1.38	The contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. However, necessary steel will be provided by BHEL free of charge from the scrap/ surplus materials available at site.
3.11.1.39	Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by contractor most expeditiously. No claim for extra payment for such work will be entertained.
3.11.1.40	The details of equipments to be erected under this contract is generally as per the schedule given in relevant annexure. 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 erection documents which will be furnished in the course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.
3.11.1.41	Instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/ speed switches of motors etc which are received in assembled condition as integral part of equipments, shall be dismounted by Contractor for calibration and shall be handed over to BHEL. Storage/ re-erection, calibration will be done by C&I erection agency of BHEL.
3.11.1.42	Actuators/ drives of dampers, gates, powered vanes etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.
3.11.1.43	Suspensions of ESP are to be tightened by calibrated torque wrench.
3.11.1.44	During the course of erection, testing and commissioning certain rework/ modification/ rectification/ repair/ fabrication etc., will be necessary on account of feed back from various power station units already commissioned and/ or units under erection and commissioning and also on account of design discrepancies or manufacturing defects and site operation/ maintenance requirements. This will also include modifications/ re-works suggested by FES/ other inspection group etc. Contractor shall carry out such rework/ modification/ rectification/ fabrication/ repair etc., promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc. shall be maintained by the contractor.
3.11.1.45	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 has to be completed within such planned shutdowns. This may call for working with enhanced resources and working on extended

	hours. Contractor's offer shall cover all such contingencies.
3.11.1.46	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.
3.11.2	ERECTION OF ELECTROSTATIC PRECIPITATOR
3.11.2.1	The details of equipments to be erected under this work are generally as per the weight schedule given in annexure-I. 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 erection documents, which will be furnished in the course of erection.
3.11.2.2	Wherever called for, pre-assembly of supporting structures, casing walls have to be done on ground.
3.11.2.3	All site welds for casing, inlet & outlet duct connections have to be kerosene tested for establishing leak proof-ness.
3.11.2.4	Loading of collecting electrodes either from top or bottom, to be decided suiting site conditions, shall be done with due care as per BHEL's instructions.
3.11.2.5	Straightness of all collecting electrodes has to be checked on ground prior to loading in to the field. Straightening of the collecting electrodes, if necessary, shall be done by the contractor within the quoted price as per instruction of BHEL engineer.
3.11.2.6	Bundle of collecting electrodes should be handled only with special fixture supplied for the purpose as regular DU.
3.11.2.7	BHEL will provide huck-bolting m/c with necessary auxiliaries free of charges. However, the contractor shall arrange electrical connections, operation etc. Contractor shall also arrange for minor maintenance of the Huck-bolting machine, including changing of some frequent worn-out spares. Required Jaws, spares and Hydraulic oil of the Machine only will be supplied by BHEL free of any charges.
3.11.2.8	Clearances as prescribed between collecting electrodes and with casing wall / emitting electrodes have to be maintained. Spot heating of collecting electrodes wherever called for, shall be done as part of work.
3.11.2.9	Erection, alignment/ fixing in final position, of high voltage rectifiers of ESP is in the scope of work.
3.11.2.10	Installation of interlocks is in the scope of work.
3.11.2.11	Complete erection, alignment, testing, pre-commissioning and commissioning etc for drive motors of collecting electrodes and emitting electrode rapping mechanism is in the scope of work.
3.11.2.12	Contractor has to fabricate and erect canopies for motors, actuators etc. as per instruction of BHEL if the same is not indicated in the drawings. However, the contractor will be paid for this work on accepted work rate of NPP as per rate schedule. BHEL will supply the material required for platforms/canopies in random lengths & sizes.
3.11.2.13	It shall be the responsibility of the contractor to provide temporary ladders on columns for initial works, if required, till permanent ladder/ stairways are completed.. Material and fabrication of temporary ladders is in the scope of contractor. All temporary ladders are to be of bolting type and no welding on to permanent members will be permitted.
3.11.2.14	Following installation jobs are also to carried out by the contractor within his quoted price.
3.11.2.14.1	Matching flanges along with all bolts, nuts, gaskets, and all the expansion joints etc. as required to be connected to the ESPs to the duct wall.
3.11.2.14.2	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 warranted by the results of flow model test, complete duct stiffening devices, interior bracings, slide plates, access doors, brackets, supporting structures, hangers, sampling connections, etc.

3.11.2.14.3	Rapping system complete with structural supporting frame, drives, and automatic rapping control, etc.
3.11.2.14.4	Ash hoppers complete with panel type heaters, level monitors and indicators, outlet flanges, jointing material, poke holes, access doors and walkways beneath the hoppers.
3.11.2.14.5	Opacity monitors complete with all accessories at the outlet of each gas stream of each ESP but upstream of the ID Fan i.e four (4) nos. per set of ESP serving one steam generator.
3.11.2.14.6	Safety devices, safety barriers, etc.
3.11.2.14.8	Monorails with electrically operated hoists on the roof for handling transformer rectifiers .Water washing system for the precipitator and hoppers along with all piping, valves and nozzles etc.
3.11.2.15	BHEL will provide free of cost only the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting /chiseling / grinding/machining and de-burr the same. However, machining of the packers wherever necessary will be arranged by BHEL.
3.11.2.16	All lifting tackles including wire-ropes slings, shackles, used by the contractor, shall be got approved by BHEL Engineer. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damages to equipment and personnel. Calibration/fitness testing certificates from recognised agency are to be submitted to BHEL site office for equipment/ instrument/ appliances to be used, as per requirement of BHEL/ISO system. Expenditure on such works forms a part of the scope of work.
3.11.2.17	The contractor shall erect scaffoldings/Temporary platforms supports etc required during erection before the permanent supports are erected. These should be of adequate capacity and shall never be overloaded. These should be replaced when not found suitable during erection work. All structure materials required for the above shall be arranged by the contractor at his own cost. No such material shall be supplied by BHEL in any case. Welding of temporary supports, cleats etc. on the columns shall be avoided. In case of absolute necessity, contractor shall take prior approval from BHEL Engineer. Further, any cutting or alteration of member of the structure or platform or other equipment shall not be done without specific prior approval of BHEL Engineer.
3.11.2.18	Proper account of the packing wood and steel supports forming part of packing will be kept by the contractor and returned to BHEL/ customer designated stores/ areas from time to time.
3.11.2.19	Temporary blanking of ESP inlet/ outlet for commissioning, if required, has to be done by contractor free of cost.
3.11.2.20	Non specified jobs at the interface/ terminal points like bolting welding, gasket changing etc. have to be done by the contractor within the quoted price.
3.11.2.21	Instrument tapping coming on the ESP to be welded/ fitted by the contractor within the quoted price.
3.11.2.22	Fixing of deflection plates in the inlet screen sheet of ESP as per flow model report, drawing to be provided by BHEL. However, adjustment re-positioning of the plates may be required to be done by the contractor during gas distribution test within the quoted rate.
3.11.2.23	All the collecting and emitting frames are to be checked in dimension and pitches before erection. All the readings are to be logged.
3.11.2.24	Erection of all electrical equipment/item like high voltage rectifier transformer sets(filled with non-inflammable silicon fluid having flash point higher than 300 deg centigrade), grounding switches, controls, leveling wheels etc, drive motors and actuators, couplings and coupling guards for all rotating auxiliaries etc, heating elements, rapping gear motor are included in the scope of the

	contractor. Erection of Insulators along with heating and ventilation system for insulator compartments, complete with fans, heaters and necessary controls are also in the scope of the contractor.
3.11.2.25	Erection of ESP electrical items coming under ESP control room like panels, controllers as well as ESP cables is excluded from the scope of contract.
3.11.2.26	Testing and commissioning of all the electrical items of ESP is excluded from the scope of contract.
3.11.2.27	Welding of high tensile structural steel shall be done by using certified welders, who posses requisite certificate and who are approved by BHEL Engineer/customer.
3.11.2.28	All welders shall be tested and approved by BHEL engineer/ customer before they are actually engaged on the work even though they may posses the requisite certificates. BHEL reserves the right to reject any welder without assigning any reasons. The contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by BHEL/ statutory requirements.
3.11.2.29	BHEL Engineer/ customer is entitled to stop any contractor's welders from his work if his work is unsatisfactory for any technical reason or in the opinion of BHEL engineer, will adversely affect the quality of welding. Even though the welder has earlier passed the tests it does not relieve the contractor from his contractual obligations, to check the performance of the welders.
3.11.2.30	All charges for testing of welders including destructive and non destructive tests, if conducted by BHEL or by the inspecting authority shall have to be borne by the contractor. All testing facility shall be made available by contractor.
3.11.2.31	Approved list of welding electrodes are given with the specification. It is mandatory on part of the contractor to use welding electrodes strictly in conformance of the list. For use of any alternative brand in case of neccessity, necessary written permission from BHEL / Customer need to be obtained.
3.11.2.32	Baking and holding of welding consumables shall be as per BHEL Welding Manual. Electrodes shall be baked and dried in Thermostat controlled oven before they are used in erection work, and all welders shall have a portable electrode drying oven at the work spot.
3.11.2.33	The contractor shall also be equipped for carrying out NDT, like liquid penetrant inspection, magnetic particle inspection, etc as & when required for work within the quoted rates.
3.11.3	PRE–COMMISSIONING TESTS AND COMMISSIONING OF THE UNIT/ EQUIPMENTS.
3.11.3.1	Gas tightness test of ESP and ducts by kerosene test / soap solution test with own consumables, labour, scaffolding and other items, if any.
3.11.3.2	Gas distribution test / flow test with own consumables, labour, scaffolding and other items, if any.
3.11.3.3	Trial run of collecting rapping, emitting rapping and GD rapping mechanism as per instruction of BHEL engineer.
3.11.3.4	Checking IR value of the ESP fields.
3.11.3.5	Air load test of ESP along with all fields.
3.11.3.6	Charging of ESP with flue gas during light-up/ synchronisation/ coal firing.
3.11.3.7	All the rapping motors, if necessary, shall be stripped open, thoroughly serviced with proper care and re-assembled before erection. During servicing if any deficiency in noticed, the same should be brought to the notice of BHEL without any delay.
3.11.3.8	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.
3.11.3.9	In case any defect is detected during tests/ trial runs, loose components,

	undue noise or vibration, strain on connected equipment etc, the contractor shall immediately attend to these defects and take necessary corrective measures. If any re-adjustment and re-alignment are necessary, the same shall be done as per BHEL engineer's instruction. This exercise may have to be repeated as per the site requirement and shall be treated as normal scope of work within the quoted rate and no additional/extra payment shall be released by BHEL to the contractor in this account.
3.11.3.10	Contractor has to provide all categories of labourers including necessary tools, measuring instruments, consumables , supervision and other inputs as required during the entire period of commissioning of ESP till handing over.
3.11.3.11	It shall be specifically noted that the above employees of the contractor may have to work round the clock alongwith BHEL commissioning Engineers and hence any over time payment may be involved. The contractor's quoted rate shall be inclusive of all these factors also. Exclusive Commissioning engineer(s)/ supervisor(s) have to be engaged by the contractor for carrying out commissioning activities round the clock during normal working days/holidays and two exclusive electricians are also required to be maintained as per the instructions of BHEL engineers .This is treated as normal scope with no extra cost.
3.11.3.12	During commissioning changing of gaskets, tightening of bolts, realigning of rotating and other equipment, attending to leakage and minor adjustments of erected equipment may arise. The quoted rate of contractor shall be inclusive of all such works.
3.11.3.13	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 contractor. 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.
3.11.3.14	In case, any rework is required because of contractor's faulty erection which is noticed during commissioning, the same has to be rectified by the contractor at his cost. If during commissioning any improvement or rectification due to design requirements is involved, the same shall be paid as extra. For this purpose, daily labour report indicating therein, nature of work carried out, consumables used etc, shall be maintained by the contractor and got signed by BHEL engineers every day.
3.11.3.15	Performance of guarantee test : The final performance and guarantee tests of the unit(s) to establish the guaranteed parameters shall be carried out by BHEL. Contractor shall assist BHEL by providing required manpower tools and consumables for carrying out the above tests. All preparatory works and temporary connections required for performing the above tests shall be carried out by the contractor free of cost. A deployment of 20 man-month approximately may be assumed by the contractor for this purpose and separate price may be quoted against the same in the rate schedule. In case assistance during performance guarantee test is not required, this amount will not be paid to the contractor.
3.11.3.16	Gas tightness test/ flow test of ESP and ducts by kerosene test/ soap solution test with own consumables, labour, scaffoldings and other items if any.
3.11.3.17	Trial run of collecting rapping , emitting rapping and GD rapping mechanism as per instruction of BHEL Engineer.
3.11.3.18	Checking IR value of ESP fields.
3.11.3.19	Air load test of ESP along with all fields .
3.11.3.20	Charging of ESP with flue gas during light up/ synchronization/ coal gas firing.
3.11.3.21	All rapping motors if necessary shall be stripped open thoroughly serviced with proper care and reassembled properly before erection by the contractor. During servicing if any deficiency is noticed the same should be taken up with BHEL engineer at site without any delay.
3.11.3.22	The instruction of the motor manufacturer regarding storage of the motors and

	re-conservation must be strictly followed without any deviation.
3.11.3.23	All the shaft equipment shall have to be properly aligned to those of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibrations 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 the recommendations of BHEL engineer before starting.
3.11.3.24	All the bearings, gear boxes etc of the equipment and electrical motors to be erected are provided with protective grease only. Contractor shall arrange for cleaning the bearings, gears etc with kerosene or some agent, as & when required by BHEL engineer, by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing/ lubricating them with recommended lubricants, which will be supplied by BHEL free of cost.
3.11.3.25	Lubricating oil units of the rotating machines are to be cleaned thoroughly before pouring of final lubricating oil.
3.11.3.26	Various categories of workman required for assistance in pre-commissioning, commissioning and post commissioning activities are as follows.
3.11.3.26.1	Electrician.
3.11.3.26.2	Mill wright fitter.
3.11.3.26.3	Fitters for ESP internal work.
3.11.3.26.4	Welders.
3.11.3.26.5	Riggers.
3.11.3.26.6	Helpers.
3.11.3.26.7	Supervisors.
3.11.3.26.8	The above group of workers may be required to work round the clock during testing & commissioning of ESP including the rotating machines covered under this package.
3.11.3.27	In case of any defect is detected during tests/ trial runs such as looseness, undue noise or vibration, strain on connected equipment etc, the contractor shall immediately attend to these defects and take necessary corrective measures. If any re-adjustment and re-alignment are necessary, the same shall be done as per BHEL engineers instruction at no extra cost.
3.11.3.28	In case any rework is required because of contractor's faulty erection which is noticed during any stage of erection/ commissioning, the same has to be rectified by the contractor at his cost. If during commissioning, any improvement or rectification due to design requirements is involved, the same shall be paid at extra rate. For this purpose, daily report indicating therein nature of work carried out, workmen deployed, consumables used etc shall be maintained by the contractor and got signed by BHEL engineers every day.
3.11.3.29	Roof top sheeting & side cladding over ESP pent house to be done by the contractor within his quoted price. Required corrugated sheets and fixing hardware will be supplied by BHEL under regular supply. Minor consumables / hardware like bitumen washers, putty etc. need to be arranged by the contractor within his quoted price.
3.11.4	PIPING (CRITICAL,SG AND TG PIPING)
3.11.4.1	Brief list of System / sub-system to be erected by the contractor & approximate weight individual PGMAs and number of joints are given in the appendices and are meant for giving general idea to the tenderer only about magnitude of the work involved. The piping components are sent in parts for convenient transportation / layout requirements. They are to be cleaned, pre-assembled in stage by stage, welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers.
3.11.4.2	For erection & welding of SA335 P91 material please refer the "PROCEDURE FOR ERECTION & WELDING OF SA335 P91 MATERIALS" given in this specification.
3.11.4.3	Pre-assembly of equipment at the pre-assembly yard for inspection, checking and erection. It is to be noted that BHEL will provide only reasonably leveled open space for pre-assembly yard. The contractor has to arrange further

	desired leveling of the area at their cost. The fixtures, steel structures required for temporary supporting for pre-assembly, checking, and welding for lifting and handling during pre-assembly and erection shall be arranged by the contractor at his own cost. Steel for such work if required shall be arranged by the contractor.
3.11.4.4	Welding non-destructive testing and heat-treatment as prescribed in BHEL Welding/ Heat treatment manual is to be carried out by the contractor. The contractor shall conduct non-destructive tests like radiography, ultrasonic test for weld defects etc., ultrasonic test for finding thickness dye, dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipments etc as per BHEL Engineer's instructions within the quoted rate.
3.11.4.5	Contractor should obtain the formal clearance from Chief Inspector of Boilers of respective state to carry out erection & Welding of piping under IBR preview. Arrangement for the visit of Boiler Inspector for field inspection etc., is in the scope of contractor, and necessary drawing / details only will be given by BHEL. Inspection fee, if any shall be paid by BHEL/Customer.
3.11.4.6	Contractor shall arrange the necessary clearance from other statutory authorities as required for installation of the plant and equipment and render all assistance, service required in this regard. Necessary co-ordination with statutory authorities including transportation, as required, for regular visit to site, is included in the scope of the contractor. However, inspection fee, if any will be paid by BHEL/ customer.
3.11.4.7	Carrying out piping as per the specification between equipment constituting terminal points, whether the terminal equipments fall with in 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, need correction by suitably resorting to heat correction or other method as instructed by BHEL Engineer, the same need to be done by the contractor within the quoted rate.
3.11.4.8	All the works such as cleaning, inspection, edge preparation if required, cutting, weld depositing, grinding, straightening, chamfering, filling, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work with in the quoted rate. Major machining work(which can be carried out in workshops only, as decided by BHEL, like tie-rod machining, any job to be carried on lathes, shapers etc. etc.) shall be done/arranged by the contractor at his cost.
3.11.4.9	Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges, re-prepare the edges to suit site conditions, which shall be done by the contractor at no extra cost. All fittings like elbows, tees, reducers, flanges, inserts etc., shall be matched with pipes for welding which may require re-edge preparation, grinding etc.
3.11.4.10	The valves will have to be checked, lapped or overhauled in full or in parts before erection / after chemical cleaning / during commissioning. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.
3.11.4.11	All the bearings, Gearboxes etc., of the equipment / actuators and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the Engineer for cleaning the bearing / gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing / lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.
3.11.4.12	The contractor shall take necessary measures to see that all the machined

	surfaces preserved and covered.
3.11.4.13	Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismount such instruments and re-erect whenever required prior to commissioning. Some time this may have to be handed over to store or instrumentation contractor.
3.11.4.14	Suction filters of BFPs, booster pumps are to be cleaned, as and when required during flushing/commissioning till the unit is handed over to customer by the contractor at his cost.
3.11.4.15	During connection & floating of TG, pump decks condenser etc, before and after pipe connections, readjusting of piping hangers is covered in this scope of work.
3.11.4.16	For other agencies, such as TG/Boiler erection, Cabling, instrumentation etc., to commence their work from / on the equipments coming under this scope, contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the over all project schedule.
3.11.4.17	All dimensions/ elevations refers to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice.
3.11.4.18	For pipes nominal size 2'' and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above sizes if the routing is shown in layouts it is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site Engineer's advice. Piping below size 2'', 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.
3.11.4.19	Contractor should fabricate bends of </=2" diameter size from running metres of pipe.
3.11.4.20	Slope of 1:500 shall be maintained towards drain unless otherwise specified.
3.11.4.21	All site-fabricated pipes will be issued in running metres as straight length. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. In some cases attachments like lugs, stoppers, cleats etc, will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing. Necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor.
3.11.4.22	Fittings like bends, tees, elbow/bends, reducers, flanges etc., will be supplied as loose items.
3.11.4.23	Certain adjustments in length may be necessary while erecting pipelines and the contractor should remove the extra lengths/add extra lengths / to suit the final layout after preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work.
3.11.4.24	Adjustment like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL Engineer to suit the layout, with specified heat treatment procedure within the quoted rate.
3.11.4.25	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 cleaned by sponge with air flushing.
3.11.4.26	Hangers & suspensions, supports etc. for tubes, piping etc will be supplied in running/ random lengths/ sizes which shall be cut to suitable sizes and adjusted as required within the quoted price.
3.11.4.27	Contractor shall arrange all the equipments, alignment bolts, tools,

	consumables like welding electrodes (all type), and argon gas cylinders etc., for welding of pipes at his cost. Consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are in contractor's scope.
3.11.4.28	Contractor shall use only bolted clamps for achieving alignment of piping, wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipments, the same shall be subjected to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., and not by hammer. Any burns left on the equipments / piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect surface and sub-surface cracks in these ground areas.
3.11.4.29	All the weld joints on equipments and piping shall be ground or filled on completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.
3.11.4.30	Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.
3.11.4.31	Flame cutting of piping shall be strictly done as per BHEL Engineer's instructions and in his presence only.
3.11.4.32	Wherever elbows of 45 deg or any other angle (>2" dia pipe) are required, the same shall be cut from 90 deg. Elbow supplied and used. No extra cost shall be paid.
3.11.4.33	The work on piping systems (air, water, oil steam, gas etc.) will include laying, edge preparation, fixing and welding of the elbows / fittings / valves etc., welded on the lines, fixing and adjustment of supports / hangers / shock absorbers and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and / or as per approved drawings/ documents.
3.11.4.34	Erection of HP bypass oil unit, valves and related site routed oil piping are included in the scope of this specification. Welding of oil pipelines/ ferrule joints applicable for oil piping are to be executed with due care for making it leak proof.
3.11.4.35	Flow nozzles, orifice, spray nozzles etc shall be mounted / erected after chemical cleaning / flushing / or steam blowing at site.
3.11.4.36	Erection of flow switches, steam traps, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting the materials from BHEL / Customer stores, transport at site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.
3.11.4.37	Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.
3.11.4.38	All drains / vents / relief / escape / safety valve piping to various tanks / sewage / drain canal / flash box / flash tank / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by the contractor is completely covered in the scope of work.
3.11.4.39	Contractor should fabricate bends at site from running metres of piping for the above and cut, edge prepare and lay the piping as per BHEL Engineer's instructions.
3.11.4.40	Fixing / fitting / welding of thermo wells, stubs, tapping points, root valves and instruments etc., on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is the scope of this specification. Thermo-wells erected on the pipelines by other agencies shall be welded by Piping contractor treating it within piping contractor's scope.
3.11.4.41	Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor. Other supports namely Hangers, U-clamps etc. shall be supplied by

	BHEL duly bent and threaded. Assembly and necessarily cutting work shall be carried out at site by contractor within the quoted rate.
3.11.4.42	For Hangers and support the instruction given in the drawing & documents must followed for handling, erection, setting of COLD / HOT values and logging etc.
3.11.4.43	Wherever hanger and support materials of piping are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the piping system on temporary supports to ensure the progress of work within quoted rate. The required structural steel materials will be issued on free of charges by BHEL, either from scrap / spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports. No additional payment shall be considered for such contingency measure.
3.11.4.44	The contractor has to erect control valves and other items received from other Units of BHEL and to be erected on the piping system and approx. tonnage per 500 MW Unit is around 200 MT
3.11.4.46	Fabrication and erection of the approach platforms for accessing eqpts/ valves/ systems erected by the contractor are included in the scope of work. Necessary structural materials will be provided by BHEL. The work shall be paid as per relevant rates of the rate schedule.
3.11.4.46	Contractor shall be supplied with two extra blue prints of the layout & isometrics. Contractor to incorporate in one of the blue prints with red ink all the charges / 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.
3.12	PRESERVATION/ TOUCH UP PAINTING/ FINAL PAINTING
3.12.1	Contractor shall carryout cleaning and preservation/ touch up painting as a part of erection work for the materials/ equipments under this tender specification right from pre-assay stage, during erection and after erection till the equipment is cleared for final painting, wherever deficiency in painting/ rusting is noticed. The primer paint shall be matching shop primer. supply and application of touch up paint, required manpower, other required consumables, T&P etc shall be provided by the contractor within the quoted rate.
3.12.2	The contractor shall effectively protect the finished work from action of weather and from damage of defacement and shall cover the finished parts, then and there, for their protection.
3.12.3	Any failure on the part of contractor to carry out work according to above clauses will entitle BHEL to carryout the job through any other party and recover the cost from contractor.
3.12.4	Final painting is included in the scope of the contract. Supply and application of painting for the entire scope of work is in the scope of contractor as per approved FQP and painting procedure/ painting schedule and paints shall be of BHEL approved manufacturer color and shade. Also, supply and application of touch-up painting & preservative painting of equipment and material in the custody of the contractor, as per requirement included in the scope of contractor. The details specification of paint & painting shall be provided at appropriate juncture. Unless otherwise mentioned, in general boiler roof top & allied heat affected areas shall be painted with heat resistant Al paint and other areas with synthetic enamel paint.
3.12.5	All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the approval of the owner.
3.12.6	All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the engineer. The quality and manufacturer of the paints shall

	require approval of the owner.
3.12.7	All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.
3.12.8	All primers shall be well marked into the surface, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the equipment. If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat.
3.12.9	Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the engineer. Spray guns shall not be used outdoors in windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment.
3.12.10	Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.
3.12.11	Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel.
3.12.12	The contractor shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.
3.12.13	Shop primer for steel and iron surfaces which will have a continuous operating temperature below 35 deg C shall be selected by the contractor, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35 deg.C.
3.12.14	The colour scheme shall be submitted during execution of contract for approval by the purchaser/ engineer.
3.12.15	PREPARATION
3.12.15.1	Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.
3.12.15.2	Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed.
3.12.15.3	The priming coat shall be applied without delay.
3.12.16	DAMAGED PAINTWORK
	Any damaged paintwork shall be made good as follows.
3.12.16.1	The damaged area, together with an area extending 25 mm around its boundary, shall be cleaned down to bare metal.
3.12.16.2	A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage.
3.12.16.3	The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.
3.12.17	PAINTING SYSTEM
	The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.
3.12.17.1	SURFACES SUBJECT TO WEATHERING
	All surfaces shall have a minimum of four coats of paint made up as follows.
3.12.17.1.1	Primer coat - 35 micron DFT.
3.12.17.1.2	Tie coat – 35 micron DFT.
3.12.17.1.3	Finishing coat (2 nos) - 35 micron DFT per coat.

3.12.17.1.4	The total minimum DFT shall be 140 micron.
3.12.17.2	SURFACES INSIDE BUILDINGS
	All surfaces shall have a minimum of four coats of paint made up as follows.
3.12.17.2.1	Primer coat - 35 micron DFT.
3.12.17.2.2	Tie coat – 35 micron DFT.
3.12.17.2.3	Finishing coat (2 nos) - 25 micron DFT per coat.
3.12.17.2.4	The total minimum DFT shall be 120 micron.
3.13	HYREAULIC TEST, PRE–COMMISSIONING & COMMISSIONING
3.13.1	Hydraulic testing pumps for pipelines/ systems/ equipment shall be provided by BHEL free of hire charges. The servicing, installation, electrical connection, erection, testing and dismantling and returning to BHEL stores etc. shall be carried out by the contractor as part of this work without any extra charges.
3.13.2	All pressure parts and some of the Low Pressure parts shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall make necessary arrangements and other services to carry out the required tests as per the instructions and directions of the BHEL Engineers.
3.13.3	Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks, valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL free of charges. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL. All Temperature element points are to be seal welded, with plug in position. All temperature element points are to be provided with blanks and welded. Necessary blanks will be provided by BHEL free of charges.
3.13.4	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.
3.13.5	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. Filling pump of suitable capacity shall be arranged by the contractor at their cost 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 valve within quoted valve.
3.13.6	All the above tests shall be repeated till all the equipment satisfy the requirement of BHEL to their customer. As far the hydraulic pressure test is concerned and same shall be conducted to the specification of Boiler Inspector wherever applicable. Any rectifications required shall have to be done / redone by the contractor at his cost.
3.13.7	HP by pass oil lines shall be oil flushed. Contractor shall have to lay temporary piping to connect the entire system irrespective of whether the equipment/ system connected has been erected by the contractor or not. Decisions of BHEL engineer in this regard will be final and binding on the contractor.
3.13.8	Commissioning of HP Bypass valves, systems, equipment are also included in contractor's scope at no extra cost to BHEL. The contractor has to maintain skilled manpower for doing this job. Adequate consumables like CTC, Petrol, markin clothes and others items as applicable to carry out this job is in contractor's scope.
3.13.9	Transportation of oil drums from customer's / 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.
3.13.10	Replacing / cleaning of filters of the erected equipments and piping system etc. during pre-commissioning / commissioning stage is within the scope of work.
3.13.11	Contractor shall lay the temporary pipelines with fittings, accessories and erection / commissioning 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. Overhauling / cleaning/ 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.
3.13.12	Chemical cleaning like Pre-Boiler system flushing will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber, wedges in the valves, gagging of valves etc. Necessary temporary access platforms to mixing tank are to be made by the contractor. Required materials will be provided by BHEL free of cost. Chemicals for chemical cleaning will be provided by BHEL free of charges and handling of chemicals & other consumables and other connected activities has to be carried out by the contractor at their cost. All other consumable would have to be provided by the contractor.
3.13.13	Laying of insulation of this temporary pipings are to be carried out by the contractor within quoted rate and required insulation materials will be provided by BHEL. The welding joints in the temporary pipelines are to be welded by qualified welders only. Required NDT tests are to carried out for the above joints within quoted rate as per customer / BHEL requirement.
3.13.14	Contractor shall lay all necessary electric cables ad switches etc. required for the hydraulic test and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.
3.13.15	During steam blowing operations the required manpower for fixing the target plates 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.
3.13.16	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.
3.13.17	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.
3.13.18	The contractor as per BHEL requirements will suitably make preservation of cleaned surfaces.
3.13.19	Raw materials for all temporary piping necessary for conducting hydraulic test, chemical cleaning, some steam blowing work, 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. Those items that are issued along with the piping components

	specified under despatchable Unit for temporary piping including tanks, pumps, valves, fittings, hangers and supports etc. supplied by BHEL or other agencies alone will be paid at the quoted rates for erection. Charges for dismantling of temporary lines etc. should be included with in the quoted rates.
3.13.20	Contractor may have to replace old / damaged gaskets / packing etc. for equipments and the same shall be carried out by contractor as per requirement without any extra cost to BHEL.
3.13.21	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.
3.13.22	Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.
3.13.23	Main Steam Line & Hot Reheat line Strainers bodies are erected first by other agency and the lines will be erected by piping contractor. All the connecting joints are to be welded by the Piping Contractor adopting special precautions. After Hydraulic Test, the strainer elements are to be fixed by other agency. During trial operation, if required, the strainers are to be removed for inspection of debries & cleaning. During all these operation piping contractor shall extend all assistance by providing necessary manpower, T&P and required materials. Installation of strainer is NOT in the scope of this contract, however its welding with pipelines etc. are included in the scope.
3.13.24	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.
3.13.25	During this period, though BHEL's and customer's staff will also be associated in the work, the contractor's responsibility will be make available resources in his scope till such time the commissioned units are taken by the customer.
3.13.26	Contractor shall cut/ open works if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. During commissioning opening of valves, changing of gaskets, attending to leakages, minor modification / rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning the same has to be rectified by the contractor at his cost.
3.13.27	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 programmes made to achieve the schedule agreed with customer.
3.13.28	After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part commissioning assistance for a period of six months or till handing over of sets to customer, which ever is earlier.
3.13.29	It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning period along with BHEL Engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.
3.13.30	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.The activities under this clause which are not due to the contractor's fault shall be

	treated as extra work and shall be paid accordingly.
3.13.31	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. For this purpose, the contractor has to arrange refixing of scaffolding alongwith other resources and this exercise may have to be repeated till satisfactory acceptance by BHEL. This is treated as contractor's normal scope of work at no extra cost to BHEL.
3.13.32	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 for working round the clock in normal working hours on working days, holidays, Sundays etc.
3.13.33	Exclusive Supervisors with two nos. minimum electrician has to be arranged within his quoted rate to carry out pre-commissioning, commissioning and handing over job.
4.0	**FURTHER DETAILS OF SCOPE OF WORK**
4.1	COLLECTION AND RETURN OF MATERIALS
4.1.1	The contractor shall identify, arrange issue and shall collect the materials from storage yard/ stores/ sheds of BHEL/ client. He shall verify the materials being issued to him, keep them in safe custody, watch and ward of materials after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the client. The contractor shall note that the transport of equipments to erection site, assembly yards etc., should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators, etc, shall be stored, when taken over by the contractor, in appropriate manner as per BHEL's instructions and as per BHEL's Storage and Preservation Manual.
4.1.2	BHEL is operating Computerized Site Operations Management System (SOMS) that includes materials management, progress reporting, sub-contractor billing and material reconciliation through a computerized data base management system. Contractor shall engage personnel with proficiency in operation of such Computerized System for the purpose of usage and regular updation of data base Management System. The SOMS/software package shall be provided by BHEL to the contractor on free of cost basis.However the contractor shall deploy their manpower for its usage etc. at their cost, for carrying out their portion of work as per tender condition.
4.1.3	The contractor may note that all operations in their scope which have interfaces with BHEL systems will have to be done only through this computerized system. The contractor has to make all arrangements for connectivity, computing equipment, personnel, software, etc. To operate and interact with BHEL system. No manual systems other than what is not covered by computerized system will be acceptable at site.
4.1.4	The contractor, within their quoted rate, have to arrange two sets of latest version of new computers of at least 500 GB Hard disc, TFT monitor minimum 17", 4GB RAM ,Intel core i7 precesser and DVD RW with MS office software of at least Windows 7 professional (64 – bit) & other utility S/W and/ or above version with two exclusive operators, colour printers (ink-jet/lasor), scanners with stationeries including computer papers/ photocopy papers and catridges/inks with regular refilling as per requirement for exclusive use of BHEL. Sufficient numbers of pen drives are to be handed over to BHEL within the quoted rate of the contractor. These facilities are to be provided by the contractor to BHEL within one month from the date of start of work and this set shall remain under the sole custody of BHEL and this service is to be retained till handing over of the unit to the customer.
4.1.5	The contractor within his quoted rate has to arrange P3e version Prima-vera software Package with trained operator for regular updation for monthly basis submission to BHEL by 20th of every month. This regular updation has to be

	done with BHEL's approval.
4.1.6	Any delay on mobilisation of computers with peripherals and operators for exclusive usage of BHEL on the part of the contractor of the total sets shall call for recoveries as per stipulated rates. In case the computer/other accessories become defective, the same has to be repaired/ replaced within two days, failing which BHEL will arrange the same at their risk and cost. Similarly in case of operators' absence, the contractor has to arrange within two days failing which BHEL will make alternative at their risk and cost.
4.1.7	The contractor has to make their own separate arrangements for their portion of MIRs/ other activities.
4.1.8	In the event the computerized 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 SOMS as and when the SOMS is reactivated/ normalized by the contractor treating at his scope of work.
4.1.9	The contractor shall handover all materials remaining extra over the normal requirement with proper identification tags in properly segregated and cleaned condition to BHEL sites. Smaller materials, Lubricants, Chemicals etc. shall be returned in neatly packed condition in addition to the above requirements. In case of any misuse or use over actual design requirement, BHEL will recover the cost of parts / materials used in excess or misused. Decision of BHEL Engineer in this regard will be final and binding on the contractor.
4.1.10	All materials shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings, etc., shall be used for handling of the materials. Use of polyester webbed flat slings with proper capacity shall be mandatory for all delicate materials. The equipment from the storage yard shall be moved 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.
4.1.11	Contractor shall remove all scrap materials at least once in a week from various levels of Boiler/ TG Floors, working area of Boiler / Piping around Power Station and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.
4.1.12	All the damaged materials, package materials/containers, special transporting frames, gunny bags, etc., shall be returned to BHEL stores / Client's stores by the contractor and proper receipt obtained for accounting/reconciliation.
4.1.13	All pipes and tube ends of pipes/tubes issued to contractor and kept at site for erection shall be covered with plastic caps/ steel caps or shall be closed with wooden plugs by the contractor. The plastic caps / Steel caps / wooden plugs will be provided by BHEL free of cost.
4.1.14	The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are erected in position.
4.1.15	Contractor shall plan and transport equipments/components from storage yard/sheds to erection site and erect them in such a manner and in a sequence that material accumulation at site should not lead to congestion. Material shall be stacked neatly, preserved and stored in the contractor's shed and work areas in an orderly manner. It may be specifically noted that the space available for putting up the Thermal Plant is very limited and accumulation of material may lead to the necessity of shifting and re-stacking the materials to enable other agencies to carry on with their work or to comply with customer's requirements. If required the contractor shall arrange shifting of surplus material expeditiously failing which the same will be arranged by BHEL and all charges together with departmental charges at 30 % will be recovered from his bill.
4.2	TAKING OVER AND DRESSING OF FOUNDATIONS, GROUTING OF EQUIPMENTS/ TANKS ETC

4.2.1	Building and foundation for supporting structures, equipments under scope of Critical Piping system in this tender specification will be provided by BHEL. The dimensional accuracy, axes, elevation, levels etc, with reference to benchmarks of foundations and anchor bolt pits have to be checked and logged. The contractor as part of the work should do adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments as per BHEL engineer's instructions. Contractor should log before taking over the foundations. Dressing and chipping of foundations to the extent of 25mm for achieving proper levels is within the scope of work.
4.2.2	Fixing of anchor points required for installing pipes, supports, hangers, equipments are in the scope of contractor including associated civil work of drilling, fixing anchor bolts, chipping holes, grouting etc. shall be in the scope of regular work. Necessary steel and anchor bolts will be provided by BHEL. However contractor shall arrange the grouting cement, quick-setting free-flow grout compound alongwith related materials, shuttering materials and other resources as applicable within the quoted price.
4.2.3	Contractor shall carry out all works necessary for Grouting of Static and Rotating equipments / Tanks & Vessels as a part of the work in scope herein. The scope shall include cleaning the main foundation/pedestal of oil, grease and other unwanted contaminants & deposits; compressed air blowing, water washing, roughening the surface, form-work/mould, mixing and pouring of grout mix, smooth finishing, curing, preparation of test coupons, getting them tested in an approved laboratory. Contractor shall use only approved grout materials like Conbextra GP-1 and Conbextra GP-2 or equivalent non-shrink free flow cement , ordinary Portland cement as applicable or other equivalent materials as approved by BHEL and this has to be supplied by contractor within his quoted rate.
4.2.4	Normally, the cut out, pockets in the civil foundation, walls and other related areas shall be arranged by BHEL's customer. However, in case certain cut outs are to be enlarged or relocated, the same shall be carried out by the contractor treating it as his own work within his quoted rate.
4.3	ERECTION OF PIPING SYSTEM
4.3.1	The scope of work in piping system (Air, Water Oil, Chemical and Steam, etc.) will include laying, edge preparation, fixing and welding of the elbows / Fittings / Valves etc., welded on the lines, fixing supports / hangers / shock absorbers, etc., and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the various paras of these specifications as per approved drawings.
4.3.2	Laying of pipelines as per the specifications, between equipments constituting Terminal point, whether the terminal equipments fall within the scope of the work / specification or not, is within the scope of the work / specification. The contractor shall complete terminal joints at both ends for all the piping schemes covered in the specification.
4.3.3	Aligning, Matching and welding of piping to the terminal points (such as stubs, on terminal equipments, stubs on headers, battery limits etc.) forming part of the scope of work / specification and stress relieving and radiography of joints so made is also within the scope of work / specification. Also, where the piping connection to the terminal points involves flanged joints mounting and welding of flanges on piping as well as terminal equipment matching of flanges fixing of gaskets, bolting and tightening as per BHEL Engineer's instruction is also in this scope of work / specifications. Required fasteners and gaskets will be supplied by BHEL free of cost.
4.3.4	Laying, aligning, welding, fixing, radiography, ultrasonic testing, stress relieving, chemical cleaning. Flushing, pickling of all the pipe lines shall be in the scope of contractor's work and forming part of piping erection.
4.3.5	The contractor has to arrange at least two no. of dewatering pumps of suitable capacity to take care of piping erection, commissioning jobs. This facility has to be retained by the contractor till handing over of the respective 500 MW Unit(s)

	to the customer.
4.3.6	Installation of Isolating Devices and removal & re-fixing of internals required for Hydraulic testing, pre-commissioning and commissioning activities are also to be done by the contractor within his quoted rate. Required gaskets will be supplied by BHEL free of cost.
4.3.7	Erection, welding, radiography and stress relieving of flow nozzles after completion of steam blowing. Removal of portions from the already erected pipelines in order to introduce Flow Nozzles, Valves and other such equipments/ devices and resultant edge preparation shall form part of normal scope of work. However contractor will be paid both for the portion of pipeline erected and later removed, as well as the equipment introduced later on in the pipeline. The removed pieces of pipes shall be returned to BHEL stores with proper cleaning, dressing and identification marking and no payment for removal and return of materials shall be made.
4.3.8	Carrier plates fit up and welding on to the pipes.
4.3.9	The following items of work shall form part of piping erection.
4.3.9.1	Matching of flanges for achieving parallelism and alignment resorting to heat correction or other suitable methods as per instructions of BHEL Engineers.
4.3.9.2	To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc, of suction, discharge, re-circulating and other connected piping and its supports at a number of place.
4.3.9.3	Increase or decrease in length of piping including change in layout to suit site conditions.
4.3.9.4	Adjustment like removal of ovalities, opening and closing of bends by process of heat correction or other suitable method as directed by BHEL Engineer.
4.3.9.5	Fabrication and erection of racks and steel supports for all the piping including of system piping. Steel for this purpose will be supplied by BHEL.
4.3.9.6	Erection of flow switches, steam traps, filters, flow meters flow nozzles, other metering elements, flow orifices, flow indicators, valves and other instrument fittings supplied either by BHEL or their customer and forming part of the system. This may involve cutting of pipe lines, fresh edge preparation and welding with stress relieving.
4.3.9.7	Fabrication/ forming of bends for pipes having dia upto 65 mm OD.
4.3.9.8	Matching of all fittings like tees, bends, flanges, reducers, valves, socket fittings, etc., with pipes for welding. This may involve weld build up, edge preparation, etc.
4.3.9.9	Servicing of valves, actuators and fittings.
4.3.9.10	Cleaning of all pipes by wire brush and flushing of compressed air.
4.3.9.11	Removal of welding slag and burrs by hand files, with brushes and / or flexible grinders.
4.3.9.12	Welding of root valves with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles / orifices / motoring elements fixed on piping.
4.3.9.13	Welding of supports to pipes using high pressure welders.
4.3.9.14	Welding of weld blanks with stress relieving if required on a temporary basis.
4.3.9.15	Opening of valve actuators, dismantling of actuators from the valves, refitting and rendering assistance connected with the electrical and mechanical problems.
4.3.9.16	On all steam piping, water (DM / Raw / Condensate / Cooling) Piping, Oil Lines / Piping, Instrument air piping. Etc., where butt welding is involved, root TIG Welding and subsequent Arc Welding shall be adopted as instructed by BHEL Engineer. The decision of BHEL Engineer regarding welding procedure for welding of above lines will be binding on the contractor.
4.3.9.17	Pipes / Tubes / Structural Materials, which are issued in running meters, may not be sent in standard lengths.
4.3.9.18	Pipe lines of Oil, Air, Steam and Water of less than NB 65 mm will be field

	routed as per schemes approved at site or as per the instructions of BHEL Engineer, and will be supplied in random lengths / Running lengths. The contractor shall have to lay the piping according to instructions at sites, after carrying out the necessary fabrication, edge preparation, routing etc., in best professional manner and as per instructions. The supports for field routed piping will be fabricated and erected by the contractor as per the requirement of the work. On completion of such Pipings, AS-BUILT Drawings to be prepared and submitted for record. The RTF of all such Drawings needs to be submitted along with 4 copies of the drawings. Contractor shall use only bolted clamps for achieving alignment of small bore piping.
4.3.9.19	'L'/'C' Bridges may be used for alignment of higher size pipelines with prior approval of BHEL. Contractor shall remove the bridges, stoppers, etc. after completion of welding by gas-cutting, followed by grinding the spot smooth and free of any surface defects. Such stoppers shall not be removed by hammering. Any scar or cavity shall be made good by welding and grinding as per the instructions of BHEL Engineer.
4.3.9.20	All weld joints on piping shall be ground or filed on completion of welding and before radiography as per instructions BHEL engineer so as to achieve smooth surface free of notches, ripples, undulations, etc. and to limit the reinforcement as per the codes.
4.3.9.21	Contractor shall erect the piping by doing pre-assembly on ground if possible at the first instant. The pipe laying shall be carried out from the available terminal point / points or any other area between the terminal points. The erection can be carried out on temporary supports to obtain proper alignment and welding. After fixing the permanent supports, all the temporary supports shall be removed. The alignment, distances and loading of the supports shall be checked and the required spring compression achieved in the case of spring hangers.
4.3.9.22	Contractor shall carryout edge preparations for welds joints in accordance with BHEL Drawings/ BHEL Standards/ BHEL Engineer's instruction.
4.3.9.23	The location of drain headers, valves, stations, steam traps of piping as indicated in the BHEL drawings are suggestive only. The final location and routings shall be decided to suit the site conditions. While routing such lines and fixing the stations, it has to be erected so as to provide easy accessibility and free path for the purpose of easy operation and maintenance. These locations shall be acceptable to the client. Sometimes, the locations of stations and routing of lines may have to be changed as per the site conditions. All such works shall be carried out expeditiously as per the instructions of BHEL Engineer. The decision of BHEL engineer is final and binding on the contractor.
4.3.9.24	It may be necessary to initially erect the pipes on temporary supports and after alignment and welding transfer the load on permanent supports.
4.3.9.25	The rate quoted in rate schedule is also inclusive of pre-heating, welding, post heating, stress relieving and NDE of piping.
4.3.9.26	Hanger rods shown in the piping arrangement drawing may have to cut and welded to suit site condition. Cutting and welding of these hanger rods will be done by the contractor. The stress relieving required on welded hanger rods shall be carried out. The hanger for piping will be tested for even distribution of load with the help of torque wrench.
4.3.9.27	The piping is provided with hand holes. The hand holes will be opened up for inspection and seal welded prior to operation.
4.3.9.28	Structural materials required for the supporting/ operating platforms required for the valves/ equipments at various levels for the safe operation will be issued to the contractor free of cost. However, the contractor's quoted rate shall include fabrication and erection of all such of platforms at site and no extra payments shall be allowed for this and only tonnage rate applicable will be payable.
4.3.9.29	Erection of piping systems shall be coordinated by the contractor as required, with the erection of the turbine generator, condenser, boiler, boiler feed pumps

	and other major equipments, approval must be obtained from the Construction Manager and the equipment manufacturer's field engineering representative prior to making piping interface connections to the aforementioned equipments. Sequence of work shall be carefully planned to minimize interference with other groups working in the same area. Actual sequence to be followed shall be subject to the approval of engineer and engineers may, at time, direct the contractor to reschedule his work as per status of the site work.
4.3.9.30	While erecting the field run pipes, the contractor shall check the accessibility of valves, instruments tapping points and maintain minimum head room requirement and other necessary clearance from the adjoining work areas to avoid interferences.
4.3.9.31	All pipe lines shall be given proper slope towards the drain points during erection.
4.3.9.32	All pipe lines shall be provided with suitable vent and the drain points with valve (s) on the highest and lower points of the pipe run although may not be specifically mentioned in the drawing as per the instructions of BHEL Engineer.
4.3.9.33	For instrument connections, pipe stubs including the instrument tubing upto the root valve(s) shall be installed by the contractor. Root valves shall be located in the convenient location / place as required by the customer to facilitate easy operation as per the decision / instruction of BHEL Engineer.
4.3.9.34	Wherever piping erected by the contractor is connected to piping or equipment erected by some other agencies, the joint at the connecting point shall be done by the contractor of this specification.
4.3.9.35	The contractor shall be responsible for correct orientation of all valves so that flow direction, seats, stem and hand wheel are in desired locations. Information regarding orientation of valves, not fully located on drawings, may be obtained from the BHEL Engineers.
4.3.9.36	The piping systems which come under the purview of IBR should generally meet the requirement of IBR. The contractor shall be well versed with all the latest amendments of Indian Boiler Regulations.
4.3.9.37	All piping shall be grouped wherever practicable and shall be routed to present a neat appearance.
4.3.9.38	Overhead piping shall have a minimum overhead clearance of 2.3 Meters above walkways and working areas and 6 Meters above roadways unless otherwise approved by the BHEL Engineer.
4.3.9.39	For field run piping, contractor shall fabricate and erect all hangers and supports as required with due regard to general arrangement layout of other pipes, hangers, cable trays, ducting, structural members, etc.
4.3.9.40	For maintaining the slopes as given in the drawings for larger thickness and larger dia pipelines, edge preparation for welding may have to be altered suitably to achieve the slope.
4.3.9.41	It may become necessary to make temporary spool pieces for the location of valves, flow measurement devices, delicate equipment etc. Contractor's scope shall include preparation, erection and dismantling of such spool pieces without any additional payment.
4.3.9.42	In pipelines like CRH lines, extraction lines, etc., the NRVs will be erected by the contractor. Alignment of these valves to match the pipe ends (Both sides), welding, heat treatment and NDE etc., shall be carried out by the contractor within their quoted rates.
4.3.9.43	All temporary lines required for Chemical Cleaning of Pre-Boiler system, Condensate pipings, Heater Drip system etc. ,Hydraulic testing, etc., shall be supplied in 'As is Where is' condition. The contractor shall arrange to carryout the required dressing, grinding, cleaning, cutting, edge preparation etc., while carrying out erection. No extra claim on this account will be entertained. For human protection, temporary insulation over piping to be applied at no extra cost.
4.3.9.44	Before laying the piping on supports, the coordinates and elevations of all supports shall be checked by the contractor for correctness. Discrepancies

	from the execution drawings, if any, shall be promptly brought to the notice of BHEL engineer in writing and correction shall be carried out as per his instructions.
4.3.9.45	Normally, hangers setting in cold condition is done by simulation adding additional temporary weight which will be roughly equal to the weight of the insulation. Attachment of temporary weights and floating of the joints in the simulation test to be treated as part of job. Hanger settings have to be repeated for achieving free floating joints. Hanger adjustments to be repeated for steam blowing by resetting hot and cold values if required. This may have to be repeated several times after steam blowing and synchronization. The weights will be supplied by BHEL. Contractor has to transport from BHEL stores and return the same after completion of work. No extra claim on this account will be entertained.
4.3.9.46	All the instrumentation Tap-off points like thermowells, Root Valves, Impulse lines, nipples, PG-test thermowells etc., shall also be erected and welded by the contractor irrespective of whether such materials are supplied by BHEL or any other agency.
4.3.9.47	For all the control valves, mechanical commissioning to be done by the contractor.
4.3.9.48	The weld grooves of MS line, HRH line, CRH line, BFD lines and other pipes will be as per BHEL standard specifications. Further, the edge preparation shall be done as per instruction of BHEL engineer and same shall be binding on the contractor.
4.3.9.49	All equipments/ works shall be preserved and protected properly during and after erection. Instructions / directions given by BHEL in this connection will have to be observed by the contractor.
4.3.9.50	The contractor has to do contingency work like laying of pipe, valves, pipe fittings and other items, in case they are received late to achieve milestone. The contractor on a later date shall re-install the actual items on a later date as per arrival of the materials at BHEL site. For this purpose, the old items are to be removed and returned to BHEL/ other designated places as decided by BHEL. Contractor have to do it treating as their normal scope of work.
4.3.9.51	The contractor within his quoted rate has to arrange for welding of SS Pipelines with TIG Welding as per applicable code .
4.3.9.52	The following works shall also be in the scope of this contract :
4.3.9.52.1	Cutting of suspension for piping etc., to suitable sizes and adjustment as required.
4.3.9.52.2	Matching of expansion/ walls/ places/ pieces, their assembly bolting and welding.
4.3.9.52.3	Pre-assembly of spring suspension/ hangers and shock absorber for the required load of piping etc.
4.3.9.52.4	Cutting of extra length of fabricated pipes or addition of spool piece to suit site conditions and layout and tie rods threads checking / length adjustment if any including rethreading.
4.3.9.52.5	Locking of spring hangers during erection, removal of locking, adjustment of spring tension for cold and hot condition and subsequent adjustment and final adjustment wherever required. Logging of spring tension readings.
4.4	WELDING, HEAT TREATMENT AND NON DESTRUCTIVE EXAMINATION (NDE)
4.4.1	WELDING
4.4.1.1	The piping shall be erected in conformity with the provision of Indian Boiler Regulations and as may be directed as per other standard / Specifications / Codes in practice. Method of welding (Viz) Arc, TIG or other methods as indicated in the erection welding schedule shall be followed, BHEL engineer will have the option to change the method to suit site conditions.
4.4.1.2	Welding and Tacking of High Pressure joints shall be done by certified High Pressure Welders who possess valid certificate of Chief Inspector of Boilers of the state in which Boiler is being erected. Welder shall also appear in advance,

	before chief inspector of Boilers of the state for re-qualification tests before expiry of the validity of the certificate, as per the provisions of Indian Boiler Regulations and keep the certificate valid till the completion of the work. The Services of such welders whose validity of certificate is expired should not be engaged on the works.
4.4.1.3	In the case of P-91 Pipe welding, Contractor shall deploy welders having experience in welding of P-91 material. The welders engaged by contractor if not qualified for P-91 Welding will be trained by BHEL at BHEL Welding research institute (WRI) Trichy and allowed to work only after passing the required test arranged by BHEL. All the expenditure towards such qualification including cost of training, traveling expenses, stay etc., shall be borne by the contractor. A separate annexure is attached for the details of P-91 welding process requirements.
4.4.1.4	All welders shall be tested and approved by BHEL engineer/Customer before they are actually engaged on work though they may possess the requisite experience certificate. BHEL reserves the right to reject any welder without assigning any reasons.
4.4.1.5	All expenses for welders qualification testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by the contractor. BHEL will provide the raw pipes and plates for preparation of test coupons free of charges.
4.4.1.6	BHEL Engineer is entitled to stop any welder from his work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which in the opinion of BHEL Engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The facts that the welders have passed the test, does not relieve the contractor from his contractual obligations to check the performance of the welders. Contractor shall submit a monthly performance record of all welders.
4.4.1.7	All welded joints shall be subject to acceptance by BHEL Engineer whose decision will be final and binding.
4.4.1.8	The High Pressure welders who possess necessary certificate shall appear well in advance before expiry of the validity of his certificate for re-qualification test as per relevant provision of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates have expired shall have to be terminated forthwith.
4.4.1.9	Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensionally and to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage shall depend on piping system as specified by BHEL Engineer.
4.4.1.10	Joint fit up will be a stage of inspection. Misalignment after fit up may vary from 0.3 mm to 1.6 mm depending on outside diameter and thickness.
4.4.1.11	For protection of all pipe joints against rusting between the fit up and actual time of welding, special de-oxidised weldable aluminium painting, as approved by site engineer, shall be done as part of work.
4.4.1.12	All H. P joints shall be subject to visual inspection after root run and subsequent welding shall be carried out after due clearance.
4.4.1.13	Welding electrodes have to be stored in enclosures having temperature and humidity control arrangement. This enclosure shall meet BHEL specifications.
4.4.1.14	Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens during shifing from backing and holding oven. Contractor has to make sufficient number of backing ovens to meet the requirement.
4.4.2	HEAT TREATMENT:
4.4.2.1	Pre-heating, Post Heating and Stress Relieving are part of erection work and shall be performed by the contractor in accordance with instructions of BHEL Engineer. During preheat and stress relieving operations the temperature shall

	be measured as per the instructions of BHEL Engineers by Thermocouples and recorded graphs for the heat treatment works carried out shall be the property of BHEL. The contractor has to provide thermo-chalks for checking preheat temperature for welding or for monitoring temperature of metal for hot correction as per BHEL Engineer's instructions.
4.4.2.2	For the purpose of stress relieving, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations are as per the standards of BHEL. Thermocouples have to be attached using Capacitor Discharge type portable thermocouple attachment unit and not by manual Arc Welding. Contractor shall arrange sufficient number of thermocouple attachment units.
4.4.2.3	Wherever necessary, contractor should provide temperature indicator / Temperature recorder as required by BHEL Engineer for measuring heat treatment temperature for welding or for controlling temperature of metal for hot correction etc. the temperature recorders should be preferable of solid state type. Decision of BHEL engineer on method and of checking preheat temperature of controlling temperature for hot correction and welding shall be final and binding on contractor.
4.4.2.4	Heat Treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The contractor shall make all necessary arrangements including labourer required for the same as per directions of BHEL.
4.4.2.5	Wherever heat treatment / stress relieving is not mentioned, but pre-heating is required on joints, the same shall be carried out as part of the work.
4.4.2.6	For weld joints of heavy structural sections, if heat treatment is required, the same shall be carried out as part of the work.
4.4.2.7	Checking effectiveness of stress relieving by hardness tests (by digital hardness tester or other approved test methods as per BHEL engineer's instruction) including necessary testing equipments is within the scope of the work/ specification.
4.4.2.8	Only Electrical Resistance Coils or Induction Coils shall be used for Pre-heating, Post Heating, Post Weld Heat Treatment and maintaining Inter-pass temperature. The coils shall be properly wrapped with asbestos or insulation material.
4.4.2.9	Oxy-Acetylene flame or exothermic chemical heating for Heat Treatment shall not be permitted. Heating shall be by means of Electric Induction Coil or Electric Resistance Coil using Copper heat Finger Elements / copper heat element pads whichever and wherever applicable should be arranged by the contractor at his own cost. The areas of the use of copper heat elements / pads will be instructed by BHEL Engineer at site to the contractor. The decision of BHEL Engineer shall be final and binding in this regard.
4.4.2.10	In the case of heat treatment for P-91 material, Ceramic Pads / Ceramic Wool of appropriate size and thickness shall be provided by contractor. Contractor has to include such requirement in his quoted rates. Thermocouple of 0.5 mm dia Teflon protected wire should be used as mentioned in the P-91 welding details.
4.4.3	NON DESTRUCTIVE EXAMINATION :
4.4.3.1	Radiographic inspection of welds shall be arranged by the contractor including all consumables like isotope camera, Film, Chemicals etc. Scaffolding and approaches for taking radiographs. The necessary skilled technician and labourers for taking the radiographs shall be provided by the contractor. While taking radiographs, the contractor has to use proper penetrameter / image quality indicators as instructed by the BHEL Engineer. All the processed and accepted films will be the property of BHEL. In this regard, the contractor has to adhere to the safety rules / regulations laid by BARC authorities from time to time. It may please be noted that invariably the radiographic work will be carried after the normal working hours.
4.4.3.2	Tenderer shall note that 100% radiography shall be taken on all high pressure

	welding till such time the welders' performance is found by BHEL Engineers to be satisfactory. Subsequently, subject to consistency in welder's performance. The percentage of radiography will be based on BHEL's standard practice/code requirement. The defects shall be rectified immediately and to the satisfaction of BHEL Engineer. The decision of BHEL Engineer regarding acceptance / rejecting the joints will be final and binding on the contractor.
4.4.3.3	Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-shots submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if defect persists after first repair, as per radiograph, carrying out repairs and radiography shall be repeated till joint is made acceptable. In case, the joint is not repairable, the same shall have to be cut and repaired at contractor's cost. Decision of BHEL Engineer in all these matters is final and binding on the contractor. Payment is considered only for radiography after clearing all defects.
4.4.3.4	100% Radiograph of certain sizes in piping have to be taken as per BHEL standards/ drawings. Radiography source deployed for should meet the requirements of BARC. All Radiographies are to be done by the Contractor within his quoted rates and no additional payment shall be entertained on this account
4.4.3.5	All field welded joints shall be subjected to dye-penetrant examination as specified in respective drawings and shall have to be accepted by BHEL Engineer. Any rectification required shall have to be done by the contractor at his cost.
4.4.3.6	a) For carrying out ultrasonic testing of welding joints, large size tubes and pipes, it will be necessary to prepare surface by grinding and buffing a smooth finish and contour as necessary. The contractor's scope of work includes such preparation and no extra charge is payable for this.
4.4.3.7	It may also become necessary to adopt inter layer Radiography/MPT/UT and final NDE combining 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.
4.4.3.8	After stress relieving 5% of UT for all critical lines and 2% of UT for other alloy steel lines to be taken to ensure soundness of joints particularly stress relieving cracks. No separate payment will be made.
4.4.3.9	All the welded joints of steam admission pipelines to HPT, IPT and LPT shall have to be subjected to non-destructive tests viz. Magnetic particle test, dye penetration test and hardness test in Addition to radiography and ultrasonic testing. All the weld seams shall be properly ground and subjected to 100% Radiographic examination.
4.4.3.10	Contractor may have to undertake Radiography with Cobalt-60 isotope camera. In case due to unavoidable circumstances Cobalt-60 is not possible to be used, the same joints shall be checked by 'Ultrasonic Test'. After completion of suitable part of the thickness, radiography with Ir–192 or other suitable source as acceptable to BARC to be done in case Cobalt-60 source cannot be used, subsequently after completing the joint UT to be done. For this contractor has to deploy Level–II operator certified by BARC.
4.4.3.11	In the case of P-91 Piping NDT requirement, since no radiography is possible, alternatively Ultrasonic Test has to be carried out apart from other NDE.
4.4.3.12	For piping of thickness less than 25 mm no radiography plugs will be provided. Radiography shots to be taken by double wall technique or any other method to be adopted in consultation with BHEL Engineer at site.
4.4.3.13	Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radiographed and new films submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out 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-radiographed at Contractor's cost. The

	evaluation charges in respect of such repeated evaluation shall have to be borne by the contractor.
4.4.3.14	Conductance of all kind of NDTs are included in contractor;s scope including arrangement of all types of resources, trained manpower, proper approach is included in the contractor's scope at no extra cost to BHEL.
4.5	PROCEDURE FOR ERECTION & WELDING OF SA335 P91 MATERIAL
	Prior to erection, supplied pipes shall be inspected thoroughly and if any defect like crack, lamination, deposit noticed, the same shall be confirmed by Liquid Penetrant Inspection. If confirmed, same shall be referred to supply unit of BHEL for required repair.
4.5.1	EDGE PREPARATION AND FIT UP.
4.5.1.1	Cutting of P-91 material shall be done by hand saw/ hack saw/ machining/ plasma cutting/ grinding only.
4.5.1.2	Edge preparation shall be done only by machining and the required edge preparation machine shall be arranged by contractor at his cost. In extreme cases, edge can be prepared by grinding with prior approval of BHEL. During edge preparation care should be taken to avoid excessive pressure to prevent heating up of the pipe edges.
4.5.1.3	All edge preparation done at site shall be subjected to Liquid Penetration Test. Weld built-up on edge preparation is prohibited.
4.5.1.4	The weld fit-up shall be carried out properly to ensure proper alignment and root gap. Neither tack welds nor bridge piece shall be used to secure alignment.
4.5.1.5	Partial root weld of minimum 20mm length by GTAW and fit-up by a clamping arrangement is recommended. Use of site manufactured clamps for fit-up is acceptable. The necessary pre-heat and purging shall be done. The fit-up shall be as per drawing. Root gap shall be 2 to 4 mm. Root mismatch shall be within 1 mm. Suitable reference punch marks shall be made on both the pipes (at 200 mm from the EP) at least on four axis to facilitate U. T on weld joint.
4.5.2	FIXING OF THETMOCOUPLES AND HEATING ELEMENTS DURING PRE-HEATING AND POST WELD HEAT TREATMENT
	No pre-heating is required for fixing T/C with resistance spot welding. Following are the equipment/ facilities for heating cycles.
4.5.2.1	Heating method - Induction heating
4.5.2.2	Thermocouples - Ni-Cr/ Ni – Al of 0.5 mm gauge size.
4.5.2.3	Temp recorder - 6 points/ 12 points.
4.5.3	ARRANGEMENT FOR PURGING :
4.5.3.1	Argon gas with requisite quality shall be used for purging the root side of weld. The purging dam (blank) shall be fixed on either side of the weld bevel prior to Pre-heating. The dam shall be fixed inside the pipe and it shall be located away from the heating zone. Purging is to be done for root welding (GTAW) followed by two filler passes of SMAW in case of butt welds. Purging is not required in case of nozzle and attachment welds, when they are not full penetration joints. The Argon gas to be used shall be dry. The flow rate is to be maintained during purging is 10 to 25 litres / minute and for shielding during GTAW is 8 to 14 ltres / minute.
4.5.3.2	Start purging from inside of pipe when root temperature reaches 220 deg. Centigrade. Provide continuous and adequate Argon gas to ensure complete purging in the root area. The minimum pre-flushing time for purging before start of welding shall be 5 minutes, irrespective of the pipe size. Wherever possible, solid purging gas chambers are to be used which can be removed after welding. If not possible, only water soluble paper is to be used. Plastic foils that are water soluble are not acceptable.
4.5.4	WELDERS QUALIFICATION
	Only qualified welding procedures are to be used. Welders qualified as

	per ASME Section – IX and IBR on P-91 material shall only be engaged. Welders logbook to be maintained and welders performance shall be monitored by BHEL site welding engineer / Quality assurance engineer.
4.5.5	PREHEATING
4.5.5.1	Prior to start of pre-heating ensure that surfaces are clean and free from grease, oil and dirt. Pre-heating temperature shall be maintained at 220 deg. Centigrade by using induction heating. The temperature shall be ensured by using a calibrated autographic recorder and two calibrated thermocouples fixed at 0 and 180 degree positions on both pipes 50 mm away from the edge. The thermocouples shall be welded with spot welding machine. The pre-heating arrangement shall be inspected and approved by BHEL engineer.
4.5.5.2	Alternate arrangements shall be made during power failure. Two additional square thermocouple are to be fixed for emergency use. Gas burners shall employed to maintain the temperature until the power resumes.
4.5.6	WELDING
	Root welding shall be done using GTAW process (as per WPS) five minutes after the start of Argon purging. Filler wires shall be clean and free from rust or oil. Argon purging shall be continued minimum two filler passes of SMAW. Argon gas to be used both for purging as well as shielding shall be of 99.99 purity level conforming to IS 5760-1998.
4.5.7	STORAGE OF WELDING CONSUMABLES :
4.5.7.1	Welding consumables are received with proper packing and marking which includes the relevant batch number for easy identification.
4.5.7.2	Electrodes are stored in their original sealed containers / packages until issued and kept in dry and clean environment taking care of shelf life.
4.5.7.3	Welding filler wires are received with proper packing and marking which includes the relevant batch number for easy identification.
4.5.7.4	The filler wires are stored in original packages until issued and kept in dry and clean environment.
4.5.7.5	The electrode GTW wires issued to the welders should be controlled through issue slips. SMAW electrodes used must be dried in drying ovens with calibrated temperature controller. The drying temperature shall be as recommended by the electrodes manufacturer. The drying temp. shall be 200 – 300 deg. Centrigrades for two hours if it is not specified by manufacturer. Portable flasks shall be used by the welders for carrying electrodes and shall be kept at 100 deg. Centrigrades. Welding shall be carried out with short arc and stringer bead technology.
4.5.7.6	The inter-pass temperature shall not exceed 350 deg. Centigrades. After completion of welding bring down the temperature to 80 – 100 deg. C and hold it at this temperature for one hour minimum. The PWHT shall commence after completion of one hour of soaking.
4.5.8	POST WELD HEAT TREATMENT :
4.5.8.1	A minimum of four thermocouples shall be placed such that at least two are on the weld and the other twoon the base material on either side of the weld within the heating band at 180 deg C apart about 50 mm from the weld joint. One stand by thermocouple shall also be provided on the weld in case of any failure of the thermocouple. The width of the heated circumferential band on either side of the weld must be al least 5 times the thickness of the weld. In case of fillet joints the heating band shall be six times the thickness of the base material. An insulation of about 10mm thickness shall be provided between the cables and the weld joints.
4.5.8.2	Obtain the clearance for post weld heat treatment cycle from BHEL QAE / welding engineer. The PWHT temp. for P-91 with P-91 material shall be 760 + 10 Deg. C and the soaking time shall be 2.5 minutes per mm of weld thickness, subject to a MINIMUM OF TWO HOURS. All

	records shall be reviewed by BHEL welding engineer prior to PWHT clearance. Heating shall be done by Induction heating only. The rate of heating/ cooling shall be as follows.
4.5.8.3	Thickness up to 50 mm - 110 deg Centrigrades
4.5.8.4	Thickness up to 50 – 75 mm - 75 deg Centrigrades/ hr (max)
4.5.8.5	Thickness more than 75 mm - 55 deg Centrigrades/ hr (max)
4.5.8.6	The width of the insulation beyond the heating band shall be at least two times the heating band width on either side of the weldment.
4.5.8.7	The recording of time and temperature shall be continuously monitored with a calibrated recorder right from pre-heating. This shall be ensured at every one hour by a site authorized personnel.
4.5.9	PREVENTIVE MEASURES DURING POWER FAILURE AND NON-FUNCTIONING OF EQUIPMENT :
	No interruption is allowed during welding and PWHT. Hence all equipment for the purpose of power supply, welding, heating etc. shall have alternative arrangements, (Diesel generator – 215 KVA for providing power to the welding and heating equipment, reserve thermocouple connections, gas burner arrangement for maintaining temperature etc.). Following preventive measures shall be adopted until normal power supply or backup power supply through diesel generator is restored.
4.5.9.1	DURING START OF PRE-HEATING
	Weld fit-up arrangement shall be immediately covered with insulation along with complete circumference of the pipe and maintained at the temperature 80 to 100 deg. C until the power resumes. The temperature shall not be allowed to fall below 80 deg. C. Gas burners shall be employed to maintain the temperature till the power resumes. Preheating may be continued after power is resumed / alternate arrangement is made.
4.5.9.2	DURING GTAW/ SMAW
	Use gas burner arrangement to maintain the temperature at 80 to 100 Deg C up to a length of 50 mm on either side from weld center line along the complete circumference of the pipe. Root welding shall be continued after power is restored and preheating temperature is raised to 220 deg. C. During the above period temperature shall be recoded through contact type theromometer.
4.5.9.3	During cooling cycle after SMAW welding to the holding temperature at 80 to 100 deg. C for one hour.
4.5.9.4	During post weld heat treatment the following shall be followed
4.5.9.4.1	During heating cycle - The whole operation to be repeated from the beginning.
4.5.9.4.2	During soaking cycle - Heat treat (soak) subsequently for the entire duration.
4.5.9.4.3	During cooling (above 335 deg. C) --- Reheat to soaking temperature and cool at the required rate.
4.5.9.4.4	In all the cases mentioned above the temperature measurement on the weld joint by means of contact type calibrated temp. gauges shall be employed to record the temperature at regular interval of 15 minutes.
4.5.10	TEMPERATURE MONITORING
	The welding and heat treatment chart shall be recorded for the following details. The actual PWHT chart shall be monitored for the following :
4.5.10.1	Pre-Heating
4.5.10.2	Interpass Temperature (GTAW + SMAW)
4.5.10.3	Cooling and holding at 80-100 deg. C for minimum one hour. Start PWHT after minimum one hour of soaking.
4.5.10.4	Heating to PWHT.
4.5.11	CAUTION
	The PWHT temperature shall not deviate from the values specified in the chart range since any deviations to the specified holding temperature range, will adversely affect the mechanical properties of the weldment and may lead to rejection of the weldment. The weld joints should be

	kept dry. Under no circumstances any water / liquid is allowed to come in contact with weld as well as pre-heated portion of the pipe.
4.5.12	CALIBRATION
	All equipment like recorder, thermocouple, compensating cable, oven, thermostat etc. should have valid calibration carried at BHEL approved labs. The calibrated reports should be reviewed and accepted by calibration In-charge at site prior to use.
4.5.13	NON DESTRUCTIVE EXAMINATION
4.5.13.1	Non destructive examination shall be done after PWHT. Prior to testing all welds shall be smoothly ground.
4.5.13.2	All welds (Butt and Fillet) shall be subjected to MPI. In addition to MPI, butt-welds and all full penetration welds shall be examined by UT.
4.5.13.3	LPI penetrant material (Dye penetrant, Solvent cleaner & developer) and medium (dry / wet particles) used in MPI shall be of BHEL approved brands only.
4.5.13.4	For Ultrasonic Testing calibration blocks used shall be of the same material specification, dia and thickness.
4.5.13.5	The UT equipment shall be calibrated prior to use and should be of digital type -- Krautkramer model USN 50 or equivalent , capable of storing calibration data as well as ultrasonic results.
4.5.13.6	All recordable indications will be stored in memory of digital flaw detector and PC for review at a later period.
4.5.13.7	The equipment calibration data for specific weld as well as the hard copy of 'Static echo-trace pattern' - showing the flow echo amplitude with respect to DAC, flaw depth, projection surface, distance and beam – path shall be attached to UT test report. This hard copy of echo-trace with equipment calibration data will form part of test documentation.
4.5.13.8	The examination as well as evaluation shall be performed by a qualified Level – II personnel and a test report shall be submitted. Any defect noticed during NDE shall be marked with a marker.
4.5.14	REPAIR OF WELD JOINTS
4.5.14.1	WELD REPAIR AT ROOT
	On visual examination during root welding if it reveals any surface defects, the same shall be removed by grinding maintaining temperature 80 – 100 deg. C and rewelded with GTAW maintaining 220 deg. C before starting SMAW.
4.5.14.2	WELD REPAIR ON COMPLETION
	Any defect observed on the weld shall be brought to the notice of Quality Assurance Engineer. The size and nature of the defect shall be reviewed. Any repair on weld to be carried out on their approval. If some defects are noticed on fully completed joint while performing UT after completion of PWHT, the same may be assessed in order to find the seriousness of the defect and to locate where exactly the defect lies from the weld outside the surface. The defect area shall be marked and repaired as below:
4.5.14.2.1	The weld shall be removed by grinding (gouging not permitted) such that the area for repair welding is free from sharp corners and provided with sufficient slope towards the weldface sides. Incase of cut and weld joints HAZ will have to be removed by grinding.
4.5.14.2.2	Surface examination (MPI/ LPI) on the ground weld area to be performed to ensure a sound base material before depositing weld layers using SMAW.
4.5.14.2.3	The temperature of the weld is to be maintained at pre-heat temperature.
4.5.14.2.4	Carry out SMAW using the same procedure as that of welding.
4.5.14.2.5	All the specified precautions with respect to welding consumables, heating cycles, post weld heat treatment etc. as followed for original welding shall be strictly adhered.

4.5.14.2.6	The NDE shall be conducted for the entire weld joint.		
4.5.14.2.7	If any further defects are observed on the repaired weld, the same may be further reworked as mentioned above.		
4.5.14.3	HARDNESS SURVEY		
	The equipment recommended to measure the hardness are EQUOTIP or MICRODUR make or equivalent portable equipment, which is to be arranged by the bidder at their cost. The equipment used for the hardness measurement shall be calibrated as recommended by the manufacturer and also on a P-91 calibration block provided by BHEL. The surface shall be cleaned and prepared as per hardness test instrument manufacturer's recommendation prior to hardness survey. Hardness survey shall be done at each joint at three locations along the circumference. At each location three ratings on weld and parent material shall be carried out. All the hardness values shall be recorded. The maximum allowable hardness at weld and parent metal shall be 300 HV10. Joints having hardness above 300 HV shall be re-heat treated and hardness shall be checked again. If hardness is still more, refer the case to Unit.		
4.5.15	COMBINATION WELDING		
4.5.15.1	For the combination of material like P-22 with P-91 and X-22 with P-91 the WPS as approved by WTC shall be given by PC for adoption.		
	Material	Temp	Soaking time
	P-91 + P-22	745 + 15 deg C	2.5 Minutes/ mm (minimum 1 hr)
	P-91 + X-22	750 + 10 deg C	2.5 Minutes/ mm
4.5.15.2	Minimum 2 hour for thickness up to 50 mm and 4 hrs. for thickness more than 50 mm.		
4.5.15.3	Precautions as required for P-91 shall be fully taken care of.		
4.5.16	SPECIFIC TRAINING FOR WELDERS		
4.5.16.1	The qualified welders who will be engaged in P-91 welding shall be given training on pipe joints simulated with P-91 welding and heating cycle conditions.		
4.5.16.2	The acquaintance on welding positions, as applicable shall be given using P-91 pipes and P-91 welding consumables, Welding techniques and instructions on Dos and DON'T's of P-91 welding. Welders who are qualified only on P-91 welding shall be engaged. Welders shall have to undergo all the training all the training above. It may be required that the welders shall have to be tested and and qualified at BHEL / WTC / TRICHY. Contractor shall arrange for the same and entire expenditure towards this shall be borne by the Contractor.		
4.5.17	CONTROL ON WELDERS		
	The welders during welding at site shall follow the correct procedures. The welders shall interact with the HT operator (Induction / Resistance equipment operator) to ensure that preheat and inter-pass temperature during welding are maintained as per requirement. The welders shall not mix the welding electrodes with that of the other welder. At the end of the shift, the unused electrodes shall be returned to the stores.		
4.5.18	PERSONNEL ENGAGED FOR HEATING CYCLE (HT OPERATOR)		
	Contractor shall deploy adequate no of heat treatment operator / technicians and electricians exclusively in shifts, who shall have adequate heat treatment experience on P-91 or similar material. HT operator shall be aware of the followings :		
4.5.18.1	The equipment used and its working principle.		
4.5.18.2	The procedure to be followed in using heating equipment.		
4.5.18.3	Procedures to be followed in case of power failure or equipment non-functioning.		
4.5.18.4	Calibration of equipment		
4.5.18.5	Method of fixing the thermocouples and compensating cablesleading to HT recorder.		

4.5.18.6	Fixing of heating pads or elements on the pipe joints and also in maintaining the temperature within the specified limits.
4.5.19	NDE PERSONNEL QUALIFICATIONS
	All the Non-Destructive Examinations shall have to be performed by Qualified NDE personnel only. Ultrasonic Testing , Magnetic Particle Inspection and Liquid Penetrant Inspection shall be carried out by ASNT / ISNT Level – II qualified personnel only.
4.5.20	SUPERVISION
	Contractor shall deploy exclusive Engineer and Supervisor who will be responsible for the completion of all activities from weld fit-up to final clearance of weld joints after satisfactory NDE and acceptance by BHEL / Customer / IBR.
4.5.21	DO'S AND DON'T'SDURING P-91 WELDING, HEAT TREATMENT AND NDE AT CONSTRUCTION SITE.
4.5.21.1	DO'S
4.5.21.1.1	Cutting by Band saw / Hack saw / Machining / Plasma cutting.
4.5.21.1.2	Pipe edge preparation by machining. Machining shall be done without excessive pressure to prevent heating up of pipe.
4.5.21.1.3	Grinding may be done on exceptional cases taking adequate care to prevent overheating.
4.5.21.1.4	Thermocouple wire (hot / cold junctions) shall be welded with condenser discharge portable spot-welding equipment.
4.5.21.1.5	Reserve thermocouples shall be made available, in case of failure of connected thermocouple elements.
4.5.21.1.6	Ensure adequate Argon gas for complete purging of air inside the pipe before starting GTAW root welding.
4.5.21.1.7	Ensure preheating at 220 deg. C minimum before GTAW root welding.
4.5.21.1.8	Start preheating only after clearance from welding engineer / Quality assurance engineer for weld fit-up and alignment of the joint as well as fixing of Thermocouples (for Induction heating).
4.5.21.1.9	Do visual inspection on root weld maintaining weld preheat temperature.
4.5.21.1.10	Continue Argon purging until the GTAW root welding followed by minimum two filler passes of SMAW is complete.
4.5.21.1.11	Perform partial root welding to facilitate fit-up, if necessary.
4.5.21.1.12	Ensure that only one layer of root welding using TGS 2CM filler wire is deposited wherever necessary.
4.5.21.1.13	Ensure proper use of TIG wires as identified by colour coding or suitable hard punching.
4.5.21.1.14	Keep the GTAW wires in absolutely clean condition and free from oil , rust etc.
4.5.21.1.15	Dry the SMAW electrodes before use.
4.5.21.1.16	Ensure inter-pass temperature is less that 350 deg. C.
4.5.21.1.17	Hold at 80-100 deg. C for a period of minimum 1 Hr. before start of PWHT.
4.5.21.1.18	Record entire heating cycle on chart through recorders.
4.5.21.1.19	Exercise control during grinding of weld and adjoining base metal while removing surface surface / sub-surface defects or during preparation of NDE.
4.5.21.1.20	Ensure no contact with moisture during preheat, welding , post heat and PWHT of weld joints.
4.5.21.1.21	Ensure removal of Argon purging arrangements after welding.
4.5.21.1.22	Use short Arc only. The maximum weaving shall be limited to 1.5 times the dia of the electrode.
4.5.21.1.23	Obtain WPS from equipment / piping supplier (combination welding) for welding of Pipe with equipment.
4.5.21.2	DON'T
4.5.21.2.1	Avoid Oxy-Acetylene flame cutting.

4.5.21.2.2	Avoid weld-build up to correct the weld end or to set right the lip of the weld bevel.
4.5.21.2.3	Avoid Arc strike on materials at the time of weld fit-up during welding.
4.5.21.2.4	Do not tack weld the thermocouple wires with manual ARC / TIG welding.
4.5.21.2.5	No GTAW root welding without thorough purging of root area.
4.5.21.2.6	Do not use Oxy-Acetylene flame heating for any heating requirement.
4.5.21.2.7	Do not use thermal chalks on the weld groove.
4.5.21.2.8	Do not stop Argon purging till completion of GTAW root welding and two layers of SMAW.
4.5.21.2.9	No tack welding or Bridge piece welding is permitted.
4.5.21.2.10	Do not use unidentified TIG wires or electrodes.
4.5.21.2.11	Do not exceed the maximum inter-pass temperature indicated in WPS.
4.5.21.2.12	Do not allow moisture, rain, water, cold wind, cold draft etc. to come in contact with the weld zone during the entire cycle from preheat to PWHT.
4.5.21.2.13	Do not exceed the limits of PWHT soaking temperature.
4.5.21.2.14	Do not interrupt the welding/ heating cycle except for unavoidable power failures.
4.5.21.2.15	Do not use uncalibrated equipment for temperature measurement during heating, welding, post-weld heat treatment etc.
4.5.22	FACILITY TO BE PROVIDED BY BHEL FOR P-91 WELDING, FREE OF CHARGES
4.5.22.1	Required No. of Induction Heating Machines with accessories.
4.5.22.2	The following consumables :
4.5.22.2.1	Annealing Cables
4.5.22.2.2	Compensating Cables
4.5.22.3	Welding electrodes for P-91 welding.
4.5.22.4	Digital Temperature indicator.
4.5.22.5	The Induction heating equipment shall be drawn from BHEL stores, transported, installed and commissioned wherever required at site. For routine and breakdown maintenance, Contractor shall have to deploy sufficient Manpower, Tools & Plants within his quoted rate.
4.5.22.6	The contractor shall provide electrical cables and switches required. All the equipment shall be protected by providing covers or sheds at site by the contractor within the quoted rate. Any loss/ damage of equipment/ tools by the contractor shall be recovered from the contractor.
4.5.23	FACILITY TO BE PROVIDED BY THE CONTRACTOR FOR P-91 WELDING
4.5.23.1	Required numbers of operators / technicians / electricians for installation, commissioning and operation continuously.
4.5.23.2	Gas burner arrangement with required gas for maintaining temperature in the event of power failure.
4.5.23.3	Ultrasonic flaw detector with recording Device & Complete accessories (Digital Type - Krautkramer model USN 50 or equivalent) capable of storing calibration data. All recordable indications will be stored in the memory of the digital flaw detector and in PC (to be arranged by contractor within his quoted rate) for review at a later period.
4.5.23.4	Spot welding Machine for fixing Thermo-couples.
4.5.23.5	EQUOTIP or MICRODUR make or equivalent portable hardness tester.
4.5.23.6	MPI & LPI kit with required consumables.
4.5.23.7	DG Power supply within 500 mtrs. From Boiler (Only for power failure during welding) including necessary cables and switches etc.
4.5.23.8	CONSUMABLES
4.5.23.8.1	Glass Fibre Cloth - 1 mm x 1000 mm - Temperature rating 1260 deg C.
4.5.23.8.2	Glass Fibre cord - Dia 3 mm (Twisted) - Temperature rating - 1260 deg C.
4.5.23.8.3	Ceramic Fibre Blanket - RT Grade, Density 96 KG / Cub. M - Temperature rating - 1260 deg. C.

4.5.23.8.4	Ceramic Fibre rope - Fibre glass braided, dia 12mm - Temperature rating 1260 deg. C.			
4.5.23.8.5	K- Type Thermocouple - 0.5 mm Dia single strand individual fibre glass insulated.			
4.5.23.8.6	Heavy duty TC connectors for K- Type Thermocouples – Size 0.5 mm dia single strand individual fibre galss insulated.			
4.5.23.8.7	All other consumables / equipment required to carry out the work.			
4.5.24	TECHNICALLY APPROVED BRANDS BY BHEL / HPBP / TRICHY.			
4.5.24.1	Liquid penetrant, penetrant remover (solvent cleaner) and Aerosol Developer from the same manufacturer considered as a family group.			
	CONTRACTOR	PENETRANT	BRAND	
			PENETRANT REMOVER	DEVELOPER
4.5.24.1.1	ITW SIGNODE (I) LTD	STOPCHECK SKL – SP	STOPCHECK SKC – 1	STOPCHECK SKD – S2
4.5.24.1.2	P – MET CO	FLAW CHECK I) PP – 15 II) PP – 110	FLAW CHECK I) PP- 21 II) PP – 120	FLAW CHECK I) PP - 31A II) PP – 131A
4.5.24.1.3	CHECKMATE CHEM PVT LTD	CHECKMATE SUPER PT – 97	CHECKMATE SUPER CL – 96	CHECKMATE SUPER DV – 98
4.5.24.1.4	PRADEEP METAL TREATMENT	FLAW GUIDE GP	FLAW GUIDE GP	FLAW GUIDE GP
4.5.24.1.5	FERRO CHEM	CRACK CHECK FC – 911	CRACK CHECK FC – 911	CRACK CHECK FC – 911
4.5.24.2	DRY MAGNETIC POWDER :			
4.5.24.2.1	MAGNAFLUX - PRODUCT GREY, 8A - RED			
4.5.24.2.2	FERROCHEM PRODUCT NO. 256			
4.5.24.2.3	K – ELECTRONICS PRODUCT - RD -- 200 (SPECIAL)			
4.5.24.3	NON–FLOROSCENT MAGNETIC INK (PREPARE BATH AS INSTRUCTED BY SUPPLIER)			
4.5.24.3.1	MAGNAFLUX - PRODUCT 9C RED WITH MX/MG CARRIER II OIL VEHICLE.			
4.5.24.3.2	FERROCHEM - PRODUCT NO 146A WITH OIL VEHICLE (WITH HIGH FLASH POINT 92 DEG C)			
4.5.24.3.3	SARDA MAGNA CHECK INK WITH OIL VEHICLE (WITH HIGH FLASH POINT 92 DEG. C)			
4.5.24.4	FLUOROSCENT MAGNETIC INK (PREPARE BATH AS INSTRUCTED BY SUPPLIER)			
4.5.24.4.1	MAGNA FLUX - PRODUCT 14 A WITH MX/MG CARRIER II OIL VEHICLE.			
4.5.24.4.2	MAGNA FLUX -- PRODUCT 14 AM - PREPARED BATH OF 14 A			
4.5.24.4.3	AND MG/ MX CARRIER-II READY TO USE WITHOUT MEASURING AND mIXING IN AEROSOL CONTAINER WITH MX/ MG CARRIER-II OILL VEHICLE.			
4.6	PRE-COMMISSIONING, COMMISSIONING AND POST COMMISSIONING OF THE UNIT			
4.6.1	The Piping work is related to various commissioning activities of the power station as follows			
4.6.1.1	Trial run of individual equipments.			
4.6.1.2	Alkali Flushing/other suitable chemical cleaning of Boiler Feed Piping and other piping with systems and equipment and restoration.			
4.6.1.3	Hydraulic test of boiler.			
4.6.1.4	Hydraulic test of piping.			
4.6.1.5	Light up of boiler.			
4.6.1.6	Boiler alkali boil out (ABO).			
4.6.1.7	Boiler acid cleaning.			
4.6.1.8	Alkali flushing/ other suitable chemical cleaning of TG piping.			
4.6.1.9	Turbine barring gear.			

4.6.1.10	Turbine rolling.
4.6.1.11	Steam blowing of boiler super heater and steam piping.
4.6.1.12	Safety valve floating.
4.6.1.13	Synchronization of unit.
4.6.1.14	Coal firing of boiler.
4.6.1.15	Full load operation, trial run and handing over of the unit (s).
4.6.2	The above activities/ tests/ trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of customer/ consultant/ statutory authorities like Boiler Inspector.
4.6.3	In case any malfunctioning and/ or defects are found during tests, trial runs such as loose components, undue noise or vibration, strain on connected equipments etc, the contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment and realignment are necessary, the same shall be done as per BHEL engineer's instructions.
4.6.4	During each stage of commissioning, if any part of the piping needs repair/ rectification/ re-work/ replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim, if any, for such repair/ rectification/ rework/ replacement, etc, for reasons not attributable to contractor will be governed by relevant clauses of SCC. The parts to be replaced shall however be provided by BHEL free of cost.
4.6.5	The pre-commissioning activities will start prior to light up of the boiler and various trials, commissioning operations shall continue till the individual 500 MW Unit(s) is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc., all these works need specialized gangs including electricians in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilization of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work undertaken round the clock if required. It is the responsibility of the contractor to discuss on day to day/ weekly/ monthly basis the requirement of manpower, consumables, tools and tackles with BHEL Engineer and arrange for the same. If any time the requisite manpower, consumables, T&P are not arranged then BHEL shall make alternate arrangements and necessary recoveries will be made alongwith overhead charges of BHEL.
4.6.6	Contractor shall cut open works if needed as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.
4.6.7	After the start of continuous operation with coal firing, the commissioning tests and maintenance activities will continue. It shall be the responsibility of the contractor to provide the following category of workers with necessary consumables, tools and tackles and supervision till handing over of the unit to the customer.
4.6.7.1	Pipe fitters/ general fitters/ millwright fitters - 2 nos.
4.6.7.2	Rigger/ unskilled workers - 5 nos.
4.6.7.3	Electricians - 2 nos.
4.6.7.3	Supervisor - 1 no.
4.6.7.4	Valve technician - 2 nos.
4.6.7.5	HP welder - 1 no.
4.6.8	The above figures shows only minimum required over and above labour required for completing pending erection commissioning works and clearing check and punch lists. Contractor has to provide number of personnel of various categories as per work demand and necessity at site. These skeleton staff are required after synchronization of the unit for attending to commissioning, post commissioning, operation and maintenance problems and

	no over run charges will be payable for providing these services unless left over jobs are also done during this period and the delay in the completion of these jobs is not attributable to the contractor.
4.6.9	It shall be specifically noted that above employees of the contractor may have to work round the clock alongwith BHEL commissioning Engineers involving considerable payment of overtime.
4.6.10	During commissioning, opening of valves, changing of gaskets, checking, resetting of hangers, realigning of rotating and other equipment, attending to leakages in valves etc., and adjustments of erected equipment may arise. All the valves shall be serviced and lubricated to the satisfaction of BHEL Engineer during the erection and commissioning as per BHEL Engineer's instructions.
4.6.11	In case any re-work/ repair/ rectification/ modification/ fabrication, etc, is required because of contractor's faulty erection which is noticed during commissioning of at any stage, the same has to be rectified by the contractor at his cost. If during commissioning, any improvement/ repair/ re-work/ rectification/ fabrication/ modification due to design improvement/ requirement are involved, the same shall be carried out by contractor promptly and expeditiously. Claims, if any, for such works from the contractor shall be governed by relevant clauses of tender.
4.6.12	It is the responsibility of the contractor to provide for necessary labour, tools and tackles and consumables till the completion of work under these specification, even in case erection, testing and commissioning of the piping and other equipments are delayed due to reasons not attributable to the contractor.
4.6.13	Contractor should specifically have electrical and mechanical technicians for servicing and maintenance of valves, actuators and strainers. The Technicians should have the expertise in dismantling the valves, re-assembly and also attending to the problems.
4.6.14	Contractor shall lay/install necessary, pumps, valves, gauges, cables, switches etc, for conduct of hydraulic test, This may involve cutting of some portion of existing piping/valves, placing of rubber wedges/ blanks in the valves and other openings Where required, bends have to be fabricated at site from running length of pipe. Temporary installation itself has to be tested, tried, and subject to non-destructive examinations as per instructions of BHEL as part of work.
4.6.15	All materials, equipments necessary for installation of temporary system as above will be supplied by BHEL in random sizes/lengths. However, servicing, fabrication, erection, dismantling of the same after completion of the process, and returning to BHEL stores shall be the responsibility of the contractor.
4.6.16	Fabrication, fit-up, welding, if any, of requisite blanks for conduct of hydraulic test is art of work. Similarly, removal of blanks, restoration and normalization of the concerned system/line is to be done as part of work. BHEL will provide the material for blanks free of charge. No separate payment is envisaged for these activities.
4.7	TECHNICAL SPECIFICATION FOR INSULATION JOB
4.7.1	SCOPE OF WORK
4.7.1.1	The work shall conform to dimension and tolerances specified in the various drawing. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost. Failing which, the work will be got done by engaging other agencies or departmentally and recoveries will be deducted from contractor's bills towards expenditure incurred including BHEL's departmental overhead charges.
4.7.1.2	Special equipment/materials such as cladding sheets, pourable refractory, mineral wool etc. shall be stored when taken over by the contractor in appropriate manner as per BHEL's instructions. Relocation/shifting if necessary, of material, T&P etc. due to site conditions/ customer requirement shall be done expeditiously as incidental to work.

4.7.1.3	The contractor shall handover all parts/ materials remaining extra over the normal requirement with proper identification tags in a packed condition if so specified, to BHEL stores, in case of any misuse or excess use over design requirements, BHEL reserve the right to recover the cost of parts /material used in excess or misused. Decision of BHEL engineer in the regard will be final and binding on the contractor.
4.7.1.4	All the pourable and castable insulation bags issued to the contractor have to be properly stored and the same should be kept in a covered storage without exposing to atmospheric conditions. For this purpose, contractor should arrange sufficient quantity of fire retardant tarpaulins or temporary covered shed.
4.7.2	LINING AND INSULATION WORKS
4.7.2.1	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.
4.7.2.2	The contractor shall provide the required quantity of wire, nails, and planks for formwork and other materials for shuttering and curing works.
4.7.2.3	Contractor shall observe all precaution for laying, curing etc of pourable insulation. The contractor at his own cost shall redo any defective works found later.
4.7.2.4	Wool insulation is received at site as loose bounded and unbounded mattresses in standard sizes. These are to be dressed/cut to suite the equipments.
4.7.2.5	Dressing of insulation bricks to suit the site area application is incidental to work.
4.7.2.6	Removable type of insulation has to be provided for valves fittings, expansion joints etc. As per drawing or as directed by BHEL engineer.
4.7.2.7	The cladding and outer casing for main boiler, integral piping, non-pressure parts, other auxiliaries, piping, TG equipment, TG piping, other vessels etc, are of aluminum sheets. All relevant specifications and procedures with regards to beading, sealing etc for alunimium sheets have to be adhered to.
4.7.2.8	The contractor should ensure that the finished work conforms to the dimension and tolerance given in the drawings.
4.7.2.9	The contractor shall leave certain gaps and openings while doing the work as per the instructions of BHEL engineer to facilitate inspection by boiler inspector or during commissioning to fix gauges, fittings, instruments. These gaps will have to be finished as per drawings at later date by the contractor at his cost.
4.7.2.10	A log book 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 without prior permission, the work should be re-done where necessitated, at his cost.
4.7.2.11	Wastage allowance for the material issued are envisaged as follows:
4.7.2.11.1	Pourable & castable insulation - 3%
4.7.2.11.2	Insulation bricks and mortar - 3%
4.7.2.11.3	Wool mattresses - 4%
4.7.2.11.4	Cladding sheets - 3%
4.7.2.11.5	The wastage allowance will be applicable on the net issued quantity i.e. total quantity issued reduced by the quantity returned to stores as unused/fresh item. Contractor shall reconcile the material issues periodically as prescribed by BHEL site. Payment for the work done will be regulated as per provision of contract.
4.7.2.12	Cladding/outer casing shall be fixed expeditiously, so as to avoid damage to the insulation from the weather.
4.7.2.13	The overlapping surface of outer casing/cladding sheet shall be coated with sealing compound, which will be supplied by BHEL free of cost.
4.7.2.14	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.
4.7.2.15	Multiple layers of mineral wool have to be applied as directed and as per drawings and specifications for boiler, TG and their auxiliaries, pipelines, valves, hanger, support items and other vessels etc, covered under the scope of work.
4.7.2.16	Contractor shall cut open works as needed as per BHEL engineer's instructions during commissioning, for inspection, checking and shall make good the works after inspection is over, without any extra cost.
4.7.2.17	In case, the insulations are to be removed for checking purpose, the same has to be removed and restored as per decision of BHEL. In case, certain insulation materials get damaged during this process, BHEL will issue additional insulation materials free of cost. This exercise may have to be repeated as per requirement of BHEL till satisfactory completion. However, the requirement of additional insulation shall be as per decision of BHEL and binding on the contractor. No extra payment shall be released by BHEL in this account.
4.7.2.18	For insulation of oil system lines having electrical tracing attached, instrument tapping, thermocouples, alunimium foil is to be wrapped around the pipeline and instruments, before applying the mineral wool. Necessary aluminium foil shall be arranged by contractor at his own cost. No separate payment will be made by BHEL for this work, including for supply of aluminium foil.
4.7.2.19	The following works are also included in the scope of this contract within his quoted rate:
4.7.2.19.1	Cutting of cladding sheets as per the profile of the equipment and painting on inner surface (two coats of bituminous paint)
4.7.2.19.2	Cutting and welding of angles, channels, running steel and sizing the same as per the site requirement.
4.7.2.19.3	Cutting of the wool mattresses to the required shape and application of finishing cement of required thickness wherever required.
4.7.2.19.4	Making of wool mattresses of required thickness and density as per requirement (if any) as per relevant application drawing / documents as part of site work.
4.7.2.20	Insulation of work of temporary piping for alkali boil out, steam blowing and acid cleaning has to be carried out at site. The same have to be removed and returned to the BHEL stores after the completion of activity. Rates quoted for application of mineral wool for boiler and auxiliaries will be applicable for this work also. No separate payment will be made for removal of temporary insulation.
4.7.2.21	Complete support and framework structure of furnace bottom enclosure, furnace rear arch enclosures, furnace extended side & bottom enclosures, vertical roof framing, deck supports and seal etc. are specially included in the scope of work.
4.7.2.22	Application of castable refractory/insulation on pressure parts before fixing and welding of inner sheet casing on rear arch tube portion of water wall, furnace bottom hopper portion of water wall upper and lower transition tube portion of water walls, radiant roof, super heater coils, rear roof super heater, rear/ front/ side/ extended side steam cooled super heater panels and any pressure part work requiring application of castable refractory directly and filling of castable refractory in seal boxes of manhole doors, peep holes, elliptical doors, etc. Gas distribution baffles, burner corner boxes or any fitting/part requiring filling of castable refractory and insulation and casting of castable refractory and insulation works of boiler, piping and auxiliaries cladding and outer sheet casing works are specially included.
4.7.2.23	Prior to application of refractory, bitumen painting on the pressure parts and other area is under contractor scope. The paints required for painting shall be supplied by the contractor at his cost, and shall be procured from BHEL approved contractors. No separate payment will be made for application of

	paint.
4.7.3	GENERAL
4.7.3.1	All extraneous steel and scaffolding materials, electricals, ladders steps, etc. welded on the supports, structural of other components during erection should be cut and removed. Burrs left behind after removal of the above should be ground as per BHEL engineer's instructions. Scars/cavities left behind should be filled up by welding and ground as per BHEL engineer's instructions.
4.7.3.2	All welded joints should be painted with anticorrosive paint immediately on completion of welding, supply of paint for this is in contractor's scope, within his quoted rate.
4.7.3.3	The preservation painting is to be carried out on materials taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer. The contractor till the completion of the work shall provide this facility. Necessary preservation paint will be supplied by the contractor within his quoted rate.
4.8	CORROSION RESISTANT PAINTS
4.8.1	Black bituminous paint
	Contractor shall arrange the required paint black bituminous paint wherever required for application on the seal box, pressure parts, cladding and outer casing sheets, within his quoted rate.
4.8.2	Contractor shall arrange the required paint for application for the purpose of bimetal corrosion protection within his quoted rate.
4.8.3	All paints, viz. Bitumen paint, preservation paint, corrosion resistant paint etc., as detailed in the tender specification, in the scope of contractor, shall be procured by the contractor from BHEL approved make contractors only.
5.0	**GENERAL RESPONSIBILITY OF THE CONTRACTOR**
5.1	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.
5.2	PRESERVATION & PROTECTION OF COMPONENTS
5.2.1	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, if required for the above work shall be provided by BHEL as free issue.
5.2.2	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.
5.2.3	Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL / client's stores. In case of failure of contractor in compliance of this requirement, BHEL will make suitable arrangement at contractor's risk and cost.
5.2.4	The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags etc. shall be returned to BHEL stores by the contractor.
5.2.5	The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage / excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with departmental charges from the contractor. Decision of BHEL on this will be final and binding on the contractor.
5.2.6	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.

6.0	**EXCLUSIONS**
	The following main items are specifically excluded from the subcontractor's scope under boiler.
6.3	C&I items appearing in product Group 95,96 & 97. However some items appearing in 95, 96 & 97 PG related to pressure parts welding like soot blower orifice, metal temp pads and clamps etc are in the scope of the contractor. seal welding of screwed type thermowells and socket type thermo wells have to be done by the contractor without any extra cost
6.4	Testing and commissioning of all HT /LT motors, actuators of valves/gate/dampers, as well as testing and commissioning of all electrical items of ESP (This supercedes any contradictory clauses, if any, appearing elsewhere in this specification regarding Electrical scope of work).
6.5	Erection of power cylinders & Commissioning of Control valves
6.6	Boiler Elevator.
7.0	**LP PIPING**
7.1	BROAD SCOPE OF WORK
7.1.1	This specification covers complete work of handling including arranging for issue of material, receipt from store/ yard, transportation to site, temporary storage prior to erection, erection & welding, dewatering during erection, protective coating (as applicable), final painting, testing at site and commissioning of LP piping and associated materials.
7.1.2	The quality plan attached with this specification specifies minimum quality control requirement. The enclosed quality plans duly certified by the bidder shall be returned to purchaser indicating his concurrence to comply with these minimum requirements. However, after award of the job, the bidder have to submit proposed QP for BHEL/ customer approval.
7.1.3	The omission of specific reference to any fabrication/ erection method, equipment or material necessary for proper & efficient working of the plant shall not relieve the bidder of the responsibility of providing such facilities to complete the work at quoted rates. Any mismatch/ defect found due to mistake in fabrication/ erection shall have to be rectified by the bidder free of cost. Inspection by BHEL/ customer does not relieve bidder of their responsibility of executing quality erection.
7.2	GENERAL TECHNICAL SPECIFICATION
7.2.1	This specification is mainly intended to cover the erection & commissioning of low pressure piping/ misc piping, which shall cover handling from storage, erection, testing, inspection, supply & application of burried protective coating, final painting, testing, servicing and commissioning of piping & fittings as covered in specification.
7.2.2	The work to be carried out under the scope of this specification shall broadly comprise of but not be limited to the following systems.
7.2.2.1	It mainly consists of following for both unit # 1 & 2
7.2.2.1.1	DMCW piping.
7.2.2.1.2	Any common system piping under DMCW/ chlroination system water supply piping/ DM water/ CW blowdown system.
7.2.2.1.3	Central lub-oil system piping.
7.2.2.1.4	Instrument/ service air/ service water/ drinking water piping for both unit # 1 & 2.
7.2.2.2	All DMCW and other LP piping system to be completed including all its drains and vents, impulse lines, as applicable.
7.2.3	The welding of pipes at terminal points shall be under the scope of this package and required to be done by the contractor.
7.2.4	Final flange connection with equipments like oil coolers/ PHE/ self cleaning strainers/ gas coolers etc is to be done by the bidder. Gaskets if required replacement due to leakage/ damage during erection is to be replaced by the contractor free of cost including supply of the gasket of required specification. Terminal point for CW piping at condenser end will be butterfly valve.
7.2.5	All erectable gaskets, fasteners and other hardware shall be supplied by BHEL

	free of cost. However, temporary gasket, if required during testing, shall have to be provided by contractor. Quoted/ accepted rates shall be inclusive of this.
7.2.6	Straight length of pipe and fabricated fittings will be supplied separately by BHEL.
7.2.7	During initial unit commissioning activities, DM water, instrument air, service air, fuel oil, etc availability thorugh temporary piping and valves may be required. Erection of the same is in the contractor scope. Payment will be made as per applicable erection rate. The piping, valves etc will be provided by BHEL free of cost. However dismantling of the piping, valve etc, its cleaning and edge preperation, for its reuse, if required, will have to done by the contractor without any extra claim.
7.2.8	Pipes for the LP piping systems will be supplied without external painting. External painting of overground piping - All touch up & final painting is under the scope of contractor including surface preparation, supply of red oxide primer and synthetic enamel paints from BHEL approved contractors.
7.2.9	No sandblasting is involved.
7.2.10	For all size of pipes, internal cleaning is to be done at site either manually or by air blowing, water flushing as per guidelines of BHEL engineer, as applicable.
7.2.11	Erection & welding, of all valves, misc fittings required to complete the system but not specifically mentioned in relevant annexure of tender is covered in the scope of contract and payment will be made as per applicable item of price schedule. All such materials will be supplied by BHEL. The erection activity of valve also includes cleaning, servicing and final painting of valves. All counter flanges, bolts, nuts, washer, gaskets etc shall be supplied by BHEL loose free of cost.
7.2.12	Commissioning assistance, post commissioning assistance and valve servicing till commercial handover of the plant to customer are included in the scope of work.
7.2.13	Calibration and commissioning of motor actuated valves, pneumatic control valves, calibration of various measuring devices, including cabling is excluded from the scope of work.
7.2.14	Any other connected material supply which is not covered in BOM but required to complete the system shall be erected by the contractor and payment in this case shall be made as per applicable item rate.
7.2.15	Minor modification of erected pipes shall be carried out by the contractor for which no extra claim shall be admissible. Any major rework required after completion of work, shall be carried out based on man-hours and the same shall be done by a special team/ gang without affecting the regular work. The record of extra man-hours in carrying out the re-work shall be maintained by the contractor which shall be duly verified and approved by the purchaser.
7.2.16	Quantities given in the relevant annexure and price schedule are indicative only. Actual supplies shall be made based on the drawings finally approved by customer.
7.2.17	Pipeline from service air header is to be laid by contractor as per site routing as per instructions of BHEL site engineer and payment will be made as per applicable item of price schedule.
7.2.18	Erection of all drains, vents, instrument tapping points with root valves, water traps etc. integral to the piping system shall be in the scope of contractor and site routing of drain, vent and miscellaneous small bore pipe shall be carried out as per direction of BHEL engineers.
7.2.19	For small bore piping, which is supplied in running length, electro-hydraulic pipe bending machines and pipe chamfering machine will be arranged and used at least to cater 3” schedule 160 pipes at site by the contractor.
7.2.20	Hanger and support/ anchors/ restraints, stubs for drains/ vents/ welded type thermowells, welding pressure connection, sockets, rain hood, cowls, aux structures for pipe supports etc for piping will be issued free as loose items. Erection, welding, painting etc of these items as per BHEL drawing is in the scope of contractor and payment for these items shall be made as per

	applicable item of price schedule. Seal welding of threaded thermowell with matching welding electrode is to be done by the contractor without any extra claim.
7.2.21	All erectable materials shall be issued by BHEL free of cost to the contractor in fabricated condition. However, only structural members like angle, channels etc may be supplied by BHEL as straight length and shall have to be cut by contractor as per execution drawing at site.
7.2.22	All pipe supports/ anchors coming on concrete floors/ walls are to be fixed with expansion/ rawl bolts with nuts. The same will be issued free to the bidder by BHEL.
7.2.23	Contractor to exercise utmost care while doing execution and commissioning work for this package so that no damage is caused to the existing plant at site. Any such damage will be back charged to contractor.
7.3	WELDING, HEAT TREATMENT & RADIOGRAPHY
7.3.1	The pipes shall be welded strictly in conformity with the methods as indicated in the detailed drawing or as instructed by BHEL engineer. BHEL engineer will have the option to change the method to suit site conditions. All the prepared/ matched edges will have to be suitably protected to prevent rusting or foreign material ingression.
7.3.2	All welded joints shall be subjected to acceptance by BHEL engineer/ customers. Contractor has to arrange for regular evaluation of radiographs without accumulation of any backlog.
7.3.3	The weld joint is to be marked with permanent mark A, B, C, etc to identify the segments. For this, a low stress stamp shall be used to stamp the pipe on the down stream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.
7.3.4	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 high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced, immediately.
7.3.5	The contractor shall also be equipped for carrying out other NDT, like liquid penetrant inspection, magnetic particle inspection and ultrasonic testing as & when required for work within the quoted rates.
7.4	CLEANING/ HYDRO TESTING/ PNEUMATIC TESTING
7.4.1	The cleaning operation is in the scope of contractor and shall be carried out as per BHEL instruction mainly consisting of (a) Mechanical cleaning; (b) Air blasting (by rupture method); (c) Water flushing; (d) Steam blowing etc as per guidelines of BHEL engineers.
7.4.2	Hydro test of all is in the scope of contractor and shall be conducted as per BHEL instructions. Necessary hand pump, filling hoses, gauges etc shall be arranged by the contractor at their own cost. Test pressure shall be as per BHEL drawing/ BHEL engineer instruction. Water including DM water, air, steam if required for cleaning, hydro test, pneumatic testing/ flushing/ blowing etc as applicable shall be provided by BHEL free of cost.
7.4.3	The contractor shall service, erect, dismantle and return temporary pipes for carrying out cleaning/ hydro test/ pneumatic test as required with no extra charges and no payment shall be paid on item rate for erection of temporary piping. All piping material, valves etc for temporary looping shall be issued to contractor free by BHEL.
7.5	FIELD FINAL PAINTING (EXTERNAL SURFACE)
7.5.1	The scope of work covers providing required manpower including supervision, providing all types of tools & plants including materials for scaffolding, consumables for scrapping, cleaning, ie surface preparation by removal of scales, flakes, rust, dirt, grease, oil and other foreign materials from the surface to be painted, mixing/ thinning of paint as per the requirement and application of primer and finish paint as per painting schedule & as specified herein and as per direction/ instruction of BHEL engineer on various piping system and its accessories as per scope of the work. The thinner, primer and finish paint of

	required specification/ make/ code/ colour shall be arranged by contractor within quoted rate.
7.5.2	Necessary scaffolding, required for painting of surfaces at various locations/ elevations shall be arranged by the contractor at their own cost. All the materials, required for scaffoldings shall be arranged by the contractor at their own cost.
7.5.3	The instructions of paint manufacturer/ BHEL's engineer shall be followed at all times. Colour code for paints, to be applied on surfaces of various equipment and system, shall be furnished during execution as per approval of BHEL/ customer.
8.0	**PROGRESS OF WORK**
8.1	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 charge incurred on this account including all expenses together with BHEL overheads from contractor's bills.
8.2	The contractor shall submit daily, weekly and monthly progress reports, manpower reports, material reports, consumables report and other reports considered necessary by the Engineer.
8.3	The manpower reports shall clearly indicate the manpower deployed category / wise daily, specifying also the activities in which they are engaged.
8.4	The progress reports shall indicate that progress achieved against planned with reasons indicating delays if any, shall give remedial action which the contractor intends to make good the slippage or lost time, so that further works can proceed as per the original programme and the slippage do not accumulate and affect the overall programme, in al format designed and approved by BHEL site Engineer.
8.5	The contractor shall arrange for weekly progress review meetings with the "Engineer" at site during which actual progress during the week vis-à-vis schedule programme shall be discussed for action to be taken for achieving targets. The programme for subsequent week shall also be presented by the contractor for discussions. The contractor shall constantly update / revise his work programme to meet the overall requirement and suit the material availability.
8.6	The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the sit premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.
8.7	The contractor shall maintain a record in the form as prescribed by BHEL for all operations carried out on each weld and maintain a record indicating the number of welds, the name of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejections if any, percentage of rejection, etc. and submit copies of the same to the BHEL Engineer as required.
8.8	In the interest of achieving project milestones, certain rescheduling of activities are to be done as per decision of BHEL. The contractor has to arrange for additional resources from time to time to achieve such milestones. No payment on whatsoever account shall be entertained by BHEL in this account.
8.9	The contractor has to submit the rolling plan for requirement of materials on regular basis for materials on weekly, monthly and quarterly basis.
8.10	The contractor should submit only computerized reports.
9.0	**DRAWINGS AND DOCUMENTS**
9.1	The detailed drawings, specifications, quality plans available with BHEL Engineers will also form part of this tender specification. Revision of drawings / documents may take place due to various considerations as is normal in such large project. Work will have to be carried out as per revised drawings /

	documents. These documents will be made available to the contractor during execution of work at site.
9.2	One set of necessary drawings / documents to carry out the erection work will be furnished to the contractor by BHEL on loan which shall be returned to BHEL after completion of the work. Contractor's personnel shall take care of these documents given to them.
9.3	The data furnished in various sections and appendices and the drawings enclosed with this tender specification describe the equipment to be installed, tested and commissioned under this specification, briefly. However, the changes in the design and in the quantity may be executed to occur as is usual in any such large scale of works.
9.4	If any error or ambiguity is discovered in the specification / information contained in the documents / drawings and tender, the contractor shall forthwith bring the same to the notice of BHEL before commencement of the work. BHEL's interpretation in such cases will be final and binding on the contractor.
9.5	In case of any conflict between general instructions to tenderers and general conditions of contract respectively and other special conditions of contract and appendices, provisions contained in special conditions of contract and appendices shall prevail.

ANNEXURE-I
APPROXIMATE WEIGHT OF VARIOUS PRODUCT GROUPS OF PER BOILER

SL NO	PRODUCT GROUP (PG)	DESCRIPTION	APPRX WEIGHT (MT)
1.0	**GROUP-I**		
1.1	4	BOILER DRUM WITH INTERNALS	232
1.2	5	WATER WALL HEADERS	172
1.3	6	WATER WALL PANELS	509
1.4	7	CIRCULATION SYSTEM e.g. DOWNCOMER & RISER TUBES AND HANGERS & SUSPENSION	306
1.5	8	BUCKSTAYS & FURNACE GUIDES	562
1.6	9	SEAL BOXES FOR FURNACE OPENING & INSTRUMENT INSERTS	10
1.7	10	SUPER HEATER HEADERS	154
1.8	11	SUPER HEATER COILS	770
1.9	12	SH SPACER TUBES, SAT. LINKS, DESH & DESH LINKS, SH HANGERS & SUPPORTS	417
1.10	15	REHEATER HEADERS	65
1.11	16	REHEATER COILS ETC.	426
1.12	17	REHEATER LINKS & SUSPENSIONS	114
1.13	18	FURNACE ROOF SKIN CASING	20
1.14	19	ECONOMISER COILS, HEADERS & PIPES	751
1.15	20	SOOT BLOWERS	63
1.16	28	FURNACE DOORS & FASTENERS	11
1.17	31	SKIN CASING & COMPONENTS	14
1.18	32	FIXING COMPONENTS FOR INSULATION (ONLY ATTACHMENTS TO PR. PARTS & PIPING)	166
SUB-TOTAL (GROUP-I)			4762
2.0	**GROUP-II**		
2.1	21	SOOT BLOWING STEAM PIPING	22
2.2	24	BOILER TRIM PIPING, SAFETY VALVES, SILENCERS, NAME PLATES ETC.	267
2.3	42	OIL SYSTEM PIPINGS	86
SUB-TOTAL (GROUP-II)			375
3.0	**GROUP-III**		
3.1	30	MAIN BOILER ENCL.	157
3.2	35	MAIN BOILER STRUCTURES	4043
3.3	36	BOILER MAIN FLOORS, STAIRS & LADDERS ETC	2718
3.4	38	INTERCONNECTING STRUCTURES & PLATFORMS	560
3.5	39	COLUMNS & FRAMES FOR DUCTING, FAN HANDLING STRUCTURES ETC.	1129
3.6	41	OIL & GAS BURNERS, IGNITORS ETC.	3
3.7	43	IGNITOR, SCANNER & SEAL AIR SYSTEM	64
3.8	45	COAL BURNERS	110
3.9	47	PULVERISED FUEL PIPING & SUPPORTS	327
3.10	48	AIR DUCTS, FLUE GAS DUCTS, DAMPERS, EXPN. JOINTS/NMEJs, DUCT SUPPORTS ETC.	2252
3.11	57	DAMPERS & GATES	594
3.12	50	STEAM COIL AIR HEATER	10
3.13	67	MILL PLANT AUXILIARIES	85
3.14	81	MISC TANKS (IBD/ CBD/ CW STORAGE TANK/ CW PUMP/ HP DOSING SYSTEM ETC)	20
3.15	99	MISC HANDLING EQUIPMENT	30
SUB-TOTAL (GROUP-III)			12102

4.0	**GROUP-IV**		
4.1	52	ROTARY REGENERATIVE AIR HEATER	1467
4.2	55 & 56	FD, ID & PA FANS ALONG WITH MOTORS AND OTHER SUB-DELIVERIES	591
4.3	61	COAL MILLS & SUB-DELIVERIES	1189
4.4	65	COAL FEEDERS	43
SUB-TOTAL (GROUP-IV)			3290
5.0	**GROUP-V**		
5.1	79	ESP COMPONENTS	8600
5.2	89	ESP GALLERIES, STAIRS, ROOF HANDRAIL	174
SUB-TOTAL (GROUP-V)			8774
6.0	**PIPING ALONG WITH ASSOCIATED VALVES AND OTHER FITTINGS LIKE FLOW NOZZLE, ORIFICE, TRAPS, THERMOWELL, STRAINER, ETC AND HANGER & SUPPORT, STRUCTURES ETC**		
6.1	PIPING ALONG WITH ASSOCIATED VALVES AND OTHER FITTINGS LIKE FLOW NOZZLE, ORIFICE, TRAPS, THERMOWELL, STRAINER, ETC		
6.1.1	80-300	MS FROM SUPERHEATER TO BOILER STOP VALVE	31
6.1.2	80-301	MS FROM BOILER STOP VALVE TO ESV	104
6.1.3	80-303	MS HEADER TO AUX PRDS	13
6.1.4	80-304	MS HEADER TO HPBP VALVE	18
6.1.5	80-310	HRH FROM REHEATER TO INTERCEPTOR VALVE	150
6.1.6	80-311	HRH FROM INTERCEPTOR VALVE TO TURBINE	13
6.1.7	80-312	LPBP VALVE UPSTREAM AND DOWNSTREAM	43
6.1.8	80-993	MISC ERECTION MATLS	1
6.1.9	80-307	HP AND LP BYPASS WARM UP	2
6.1.10	80-320	CRH FROM TURBINE TO REHEATER	135
61.11	80-321	HPBP VALVE TO CRH PIPING	11
6.1.12	80-340	AUX STEAM HEADER	6
6.1.13	80-341	AUX STEAM HEADER INTERCONN BETWEEN UNITS	35
6.1.14	80-342	AUX STEAM TO SCAPH	8
6.1.15	80-343	AUX STEAM TO AH SOOT BLOWERS	2
6.1.16	80-344	AUX STEAM TO FO SYSTEM TP	18
6.1.17	80-345	AUX STEAM TO DEAERATING HEATER	8
6.1.18	80-362	EXHAUST STEAM FROM PRIME MOVERS-SG SCOPE	25
6.1.19	80-366	IBD TANK VENT TO ATMOSPHERE	11
6.1.20	80-373	AUX STEAM HEADER SV EXHAUST	4
6.1.21	80-395	AUX STEAM TO FUEL OIL ATOMISING	1
6.1.22	80-400	CONDENSATE SUCTION	7
6.1.23	80-401	CD FROM PUMP TO LPH1/DC INLET TEE AND RE	30
6.1.24	80-402	CD FROM LPH1/DC INLET TEE TO TG TP	20
6.1.25	80-403	CD FROM TG TP TO DEAERATING HEATER	9
6.1.26	80-407	CONDENSATE FOR SEALING OF VACUUM	5
6.1.27	80-408	CONDENSATE DUMP FROM HEADER	1
6.1.28	80-412	CONDENSATE TRANSFER	5
6.1.29	80-418	ERECTION MATERIALS FOR INSTRUMENTS	0.5
6.1.30	80-419	DEAERATOR SAFETY VALVE EXHAUST TO ATM	3
6.1.31	80-420	BOILER FEED PUMP SUCTION	18
6.1.32	80-421	BOILER FEED PUMP RECIRCULATION	26
6.1.33	80-423	BOILER FEED PUMP TO HPH INCLUDING BYPASS	65
6.1.34	80-424	BFD BETWEEN HTRS AND GROUP PROTECTION VL	24
6.1.35	80-425	BFD FROM FINAL HPH TO SG TP	112
6.1.36	80-430	SPRAY WATER TO HPBP	5
6.1.37	80-432	SPRAY WATER TO BOILER DESH UPTO SG TP	17
6.1.38	80-433	SPRAY WATER FROM BFP INTERSTAGE	4
6.1.39	80-446	DEAERATING HEATER OVER FLOW AND DRAIN	4
6.1.40	80-450	CBD AND EMERGENCY DRUM DRAIN	2
6.1.41	80-451	BOILER INTEGRAL PIPING DRAINS	17

6.1.42	80-452	HP PIPING DRAINS - SG SCOPE	35
6.1.43	80-453	LP PIPING DRAINS - SG SCOPE	5
6.1.44	80-901	SUB DELIVERY VALVES FOR LIGHT UP	4
6.1.45	81-415	TEST THERMOWELLS	0.5
6.1.46	81-437	SUPERVISORY CONTROL PANEL	0.5
6.1.47	81-441	EHT - TAPES AND ACCESSORIES	1
6.1.48	81-444	EHT-POWER DISTRIBUTION PANEL	1
6.1.49	80-323	STEAM TO BFP DRIVE TURBINE	4
6.1.50	80-324	CRH HEADER TO AUX.PRDS	1
6.1.51	80-322	CRH PIPING TO DEAERATING HEATER	10
6.1.52	80-329	EXTRACTION STEAM TO BFP DRIVE TURBINE	13
6.1.53	80-335	EXTRACTION STEAM TO DEAERATING HEATER	17
6.1.54	80-336	EXTRACTION STEAM TO HP HEATER NO.1	8
6.1.55	80-337	EXTRACTION STEAM TO HP HEATER-2	6
6.1.56	80-339	AUX STEAM TO BFD TURBINE	1
6.1.57	80-349	AUX STEAM TO GL AND SEALS - TG SCOPE	1
6.1.58	80-351	AUX STEAM TO UNLISTED USERS - SG SCOPE	10
6.1.59	80-364	CBD TANK VENT TO SYSTEM	1
6.1.60	80-365	CBD TANK VENT/SV EXHAUST TO ATMOSPHERE	1
6.1.61	80-436	SPRAY WATER TO LPBP DESH	3.5
6.1.62	80-447	HP HEATER DRAINS	15
6.1.63	80-673	LUBE OIL PIPING SYSTEM	8
SUB-TOTAL (PIPING ALONG WITH ASSOCIATED VALVES AND OTHER FITTINGS LIKE FLOW NOZZLE, ORIFICE, TRAPS, THERMOWELL, STRAINER, ETC)			1159
6.2	HANGER & SUPORT, STRUCTURES, ETC		
6.2.1	80-920	HANGER AND SUPPORT FOR HYDRO TEST	132
6.2.2	80-940	AUX STRUCTURE FOR CRITICAL PIPING	200
6.2.3	80-921	HANGER AND SUPPORT FOR LIGHT UP STEAM LINE	60
6.2.4	80-928	HANGER AND SUPPORT FOR BOILER LIGHT UP	150
6.2.5	80-933	HANGER AND SUPPORT FOR LP PIPING	35
6.2.6	80-930	H AND S FOR SYNCHRONISATION - TG	15
6.2.7	80-934	STANDARD HANGER COMPONENTS	10
SUB-TOTAL (HANGER & SUPORT, STRUCTURES, ETC)			602
7.0	**INSULATION**		
7.1	BOILER AND AUXILIARIES		
7.1.1	POURABLE INSULATION		300
7.1.2	CASTABLE REFRACTORY & BRICK		160
7.1.3	MINERAL WOOL, SLAG WOOL, BONDED WOOL MATTRESS, BHAT INSULATION, ACOUSTIC INSULATION, SEALING COMPOUNDS, ASBESTORS MATERIALS, ETC.		1158
7.1.4	IRON/STEEL COMPONENTS FOR FIXING INSULATION INCLUDING WIRE, WIRE MESH, WIRE CLOTH,SHEET, RETAINER, FIXING PINS, CASING SUPPORTS, PLATES, FLATS, ANGLES, BRACKETS, BEND PLATES, WELD STUDS, TUBES, DRUM END DOOR COVER ETC.		180
7.1.5	ALUNIMIUM CLADDING SHEETS/CORRUGATED SHEETS		200
7.2	BOILER OUTER CASING		
7.2.1	BOILER OUTER CASING COMPONENTS		38
7.2.2	BOILER OUTER CASING SHEETS		43
7.3	BOILER INTREGRAL PIPINGS, VALVES, VASSELS, POWER CYCLE PIPING INCLDING IC VALVES TO TURBINE , TG AUXILLARIES, HEAT EXCHANGERS GLAND COOLERS, FLASH TANKS, PUMPS DEREATORS, FST, ETC,		
7.3.1	BONDED MINERIAL WOOL MATTRESSES		270
7.3.2	ALUMINIUM CLADDING SHEETS		80
7.3.3	FIXING COMPONUNTS & MISC OTHER ITEMS.		35
7.3.4	SEALING COMPONENTS		1

7.4	ESP	
7.4.1	MINERAL WOOL AND FIXING COMPONENT FOR ESP INSULATION	336
SUB-TOTAL (GROUP-VII)		2801
8.0	**TEMPORARY PIPING**	
8.1	ACID CLEANING PIPING	50
8.2	HANGER AND SUPPORT FOR ACID CLEANING PIPING	8
8.3	STEAM BLOWING PIPING	61
8.4	HANGER AND SUPPORT FOR TEMPORARY PIPING	9
SUB-TOTAL (TEMPORARY PIPING)		128

NOTE	
1	Besides product groups indicated herein, there is likelihood of addition of new product groups by BHEL's unit/ site for release of some items, integral to this work. Bidder's quoted/ accepted unit rates shall be applicable for such product groups also.
2	BHEL's decision with regard to classification of a particular product group is binding on the contractor.
3	The weights indicated in above schedule are approximate only and are liable to variations and alternations as per stipulations of tender.

ANNEXURE-II
APPROXIMATE ERECTION WELD SCHEDULE PER BOILER

SL NO	DESCRIPTION	MATERIAL	SIZE (OD X THK IN MM)	NO OF FIELD WELDS
1	RH STAGE I INLET HEADER NIPPLE + RH STAGE I COIL	SA 213 T11 + SA 213 T11	63.5 X 4.0	74
2	RH STAGE I INLET HEADER NIPPLE + RH STAGE I COIL	SA 213 T11 + SA 213 T11	47.63 X 4.5	74
3	RH STAGE I INLET HEADER NIPPLE + RH STAGE I COIL	SA 213 T11 + SA 213 T11	47.63 X 8.6	222
4	RH STAGE I INLET HEADER NIPPLE + RH STAGE I COIL	SA 213 T11 + SA 213 T11	47.63 X 10.0	148
5	RH STAGE I COIL + RH STAGE I OUTLET HEADER NIPPLE	SA 213 T22 + SA 213 T22	54.0 X 4.0	518
6	RH STAGE I OUTLET HEADER + LINKS + RH STAGE II INLET HEADER	SA 335 P22 + SA 335 P22	660.4 X 40.0	6
7	RH STAGE II INLET HEADER NIPPLE + RH STAGE II COIL	SA 213 T22 + SA 213 T22	63.5 X 4.0	74
8	RH STAGE II INLET HEADER NIPPLE + RH STAGE II COIL	SA 213 T22 + SA 213 T22	63.5 X 12.0	370
9	RH STAGE II COIL + RH STAGE II OUTLET HEADER NIPPLE	SA 213 T91 + SA 213 T91	54.0 X 5.0	888
10	SC SPACER TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	51 X 5.0	3
11	SC SPACER TUBE + TUBE	SA 210 GR.C + SA 213 T11	51 X 5.0	15
12	SC SPACER TUBE + TUBE	SA 213 T11 + SA 213 T11	51 X 6.6	74
13	RG PLUG + PIPES	SA 105 + SA 106 GR.C	--	22
14	RG PLUG + HDR	SA 105 + SA 106 GR.C	--	3
15	ECO FEED PIPE + VAVLE	SA 106 GR.C + SA 234 WCB	457.2 X 50	1
16	REDUCER + ECO INLET HDR	SA 234 WPC + SA 106 GR.C	508 X 75	1
17	ECO INLET HDR SPLIT	SA 106 GR.C + SA 106 GR.C	508 X 75	1
18	ECO INLET HDR NIPPLE + LOOSE TUBE	SA 210 GR.A1 + SA 210 GR A1	38.1 X 5.3	316
19	LOOSE TUBE + ECO LOWER COIL	SA 210 GR.A1 + SA 210 GR A1	38.1 X 5.3	316
20	ECO LOWER COIL + ECO INTER COIL	SA 210 GR.A1 + SA 210 GR A1	38.1 X 5.3	316
21	ECO INTER COIL TO + ECO UPPER COIL	SA 210 GR.A1 + SA 210 GR A1	38.1 X 5.3	316
22	ECO UPPER COIL +	SA 210 GR.A1 +	38.1 X 5.3	32

	LOOSE TUBE & HEADER NIPPLE	SA 210 GR A1		
23	ECO UPPER COIL + ECO OUTLET HDR	SA 210 GR.A1 + SA 210 GR A1	38.1 X 5.3	260
24	ECO OUTLET HDR (SPLIT)	SA 106 GR.C + SA 106 GR.C	406.4 X 60	1
25	RG PLUG + PIPE	SA 106 + SA 106 GR.C	--	3
26	HDR + LINK	SA 106 GR.C + SA 234 WP.C	406.4 X 45	2
27	LINK + LINK	SA 106 GR.C + SA 106 GR.C	368 X 40	13
28	LINK + LINK	SA 106 GR.C + SA 106 GR.C	323.5 X 35	6
29	LINK + DRUM NOZZLE	SA 106 GR.C + SA 106	323.0 X 32	3
30	SH.CONN. PIPES PIPE + PIPE	SA 106 GR.C + SA 106 GR.C	159 X 18	63
31	RAD ROOF INLET HDR (SPLIT)PIPE + PIPE	SA 106 GR.C + SA 106 GR.C	273 X 45	1
32	RADIANT ROOF TUBE +TUBE	SA 213 T 11 + SA 213 T11	63.5 X 6.3	152
33	TUBE +TUBE	SA 213 T 11 + SA 213 T11	57 X 6.0	150
34	TUBE +TUBE	SA 213 T 11 + SA 213 T11	57 X 6.0	158
35	RAD ROOF OUTLET HDR (SPLIT)	SA 106 GR.C + SA 106 GR.C	406.4 X 6.0	1
36	RAD.ROOF OUTLET HDR + SIDE WALL IN HDR PIPE + PIPE	SA 106 GR.C + SA 105 GR.C	406.4 X 37.4	2
37	SIDE WALL TUBE FRONT + HDR NIPPLE	SA 210 GR.C + SA 210 GR.C	63.5 X 6.3	110
38	SIDE WALL REAR + HDR NIPPLE	SA 210 GR.C + SA 210 GR.C	51 X 5.0	56
39	TUBE + TUBE	SA 210 GR.A1 + SA 210 GR.A1	76.1 X 12.5	6
40	TUBE + TUBE + HDR NIPPLE	SA 210 GR.C + SA 210 GR.C	63.5 X 6.3	330
41	TUBE + TUBE + HDR NIPPLE	SA 210 GR.C + SA 210 GR.C	51 X 5	168
42	SIDE WALL OUT HDR + FRONT WALL IN HDR PIPE + PIPE	SA 106 GR.C + SA 106 GR.C	406.4 X 65	2
43	FRONT WALL INLET HDR (SPLIT) PIPE + PIPE	SA 106 GR.C + SA 106 GR.C	406.4 X 65	1
44	FRONT WALL TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	51 X 5	126
45	FRONT WALL TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	63.5 X 6.3	4
46	NIPPLE + TUBE	SA 210 GR.C + SA 210 GR.C	38.1 X 5.0	276
47	FRONT WALL TUBE + HANGER TUBE FRONT WALL + FRONT WALL HDR	SA 210 GR.C + SA 210 GR.C	51 X 5.0	252
48	TUBE +TUBE	SA 210 GR.C + SA 210 GR.C	51 X 5.0	126
49	REAR ROOF TUBE +	SA 210 GR.C +	51 X 5.0	126

	HANGER TUBE	SA 210 GR.C		
50	TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	38.1 X 5.0	276
51	TUBE + ECO.HDR TUBE	SA 210 GR.C + SA 210 GR.C	38.1 X 5.0	276
52	HANGER TUBE + HANGER TUBE	SA 210 GR.C + SA 210 GR.C	44.5 X 7.1	552
53	HANGER TUBE + NIPPLE	SA 210 GR.C + SA 210 GR.C	44.5 X 7.1	276
54	SH SUPP TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	51.0 X 11.0	20
55	LTSH HGR TUBE + HDR NIPPLE & HGR TUBE + HGR TUBE	SA 210 GR.C + SA 210 GR.C	51.0 X 11.0	744
56	HGR TUBE + HGR TUBE	SA 210 GR.C + SA 210 GR.C	51.0 X 11.0	248
57	HGR TUBE + HGR TUBE	SA 210 GR.C + SA 210 GR.C	51.0 X 11.0	438
58	REAR WALL TUBE + HDR NIPPLE	SA 210 GR.C + SA 210 GR.C	51 X 5	137
59	TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	51 X 5	137
60	HDR NIPPLE + TUBE	SA 210 GR.C + SA 210 GR.C	51 X 5	137
61	SIDE WALL OUT HDR. RR WALL LOWER HDR PIPE + PIPE	SA 106 GR.C + SA 106 GR.C	323.9 X 50	2
62	RR WALL LOWER HDR (SPLIT) PIPE + PIPE	SA 106 GR.C + SA 106 GR.C	323.9 X 50	1
63	BIFURCATE TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	51 X 5	4
64	TUBE + TUBE	SA 210 GR.C + SA 210 GR.C	63.5 X 6.3	6
65	HDR NIPPLE + TUBE	SA 210 GR.C + SA 210 GR.C	44.5 X 4.5	137
66	TUBE + HEADER NIPPLE	SA 210 GR.C + SA 210 GR.C	44.5 X 4.5	137
67	BIFURCATE HDR NIPPLE	SA 213 T 11 + SA 213 T11	47.63 X 6.0	372
68	BIFURCATE + COIL TUBE	SA 213 T 11 + SA 213 T11	47.63 X 6.0	744
69	LOWER + UPPER COIL TUBE + TUBE	SA 213 T 11 + SA 213 T11	47.63 X 6.0	744
70	UPPER COIL + PENDENT TUBE	SA 213 T 11 + SA 213 T11	47.63 X 6.6	744
71	PENDENT COIL + HDR LOOSE TUBES	SA 213 T 11 + SA 213 T11	47.63 X 6.6	744
72	LOOSE TUBES + NIPPLE	SA 213 T 22 + SA 213 T22	47.63 X 6.6	744
73	DISK LINKS ELBOW + LINK	SA 335 P12 + SA 335 P12	457.5 X 50	4
74	DESH + LINKS	SA 335 P12 + SA 335 P12	457.5 X 60	4
75	DESH + LINKS + LINKS + DIV. IN HDR	SA335 P12 + SA 335 P12	457.2 X 56	6
76	PIPE + PIPE	SA335 P12 + SA 335 P12	457.2 X 56	2
77	SH DIV PANELLETT	SA 213 T11 + SA	51 X 6	480

	NIPPLE + LOOSE TUBES & LOOSE TUBES + COIL TUBE	213 T11 & SA 213T11 +SA 213 T22		
78	SH DIV PANELLETT NIPPLE + LOOSE TUBES & LOOSE TUBES + COIL TUBE	SA 213 T11 + SA 213 T11 & SA 213T11 +SA 213 T22	51 X 6.3	480
79	SH DIV PANEL + COIL + LOOSE TUBES (OUTLET SIDE)	SA 213T11 +SA 213 T22	44.5 X 7.1	384
80	SH DIV PANEL LETT COIL + LOOSE TUBES (INLET SIDE)	SA 213T11 +SA 213 T22	44.5 X 5	384
81	LINKS + PLATEN INLET HDR PIPE + PIPE	SA 335 P12 + SA 335 P12	508 X 65	6
82	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	63.5 X 9.1	26
83	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	51 X 5.6	50
84	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	51 X 7.1	50
85	SH PLATEN COIL + OUTLET NIPPLE	SA 213 T22 + SA 213 T22	63.5 X 12	25
86	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	54 X 6.3	25
87	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	51 X 8.0	100
88	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	44.5 X 5.6	75
89	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	44.5 X 8.6	25
90	SH PLATEN COIL + INLET NIPPLE	SA 213 T22 + SA 213 T22	44.5 X 9.0	50
91	SH PLATEN COIL + OUTLET NIPPLE	SA 213 T22 + SA 213 T22	54 X 12	75
92	SH PLATEN COIL + OUTLET NIPPLE	SA 213 T22 + SA 213 T22	51 X 11	25
93	SH PLATEN COIL + OUTLET NIPPLE	SA 213 T22 + SA 213 T22	44.5 X 11	100
94	SH PLATEN COIL + OUTLET NIPPLE	SA 213 T22 + SA 213 T22	44.5 X 9.0	175
95	TUBE + TUBE	SA 213 TP 347 H + SA 213 TP 347 H	63.5 X 8.0	12
96	NIPPLE + TUBE	SA 213 T11 + SA 213 T22	63.5 X 8.0	6
97	TUBE + TUBE	SA 210 C + SA 210 C	51 X 5	3
98	TUBE + TUBE	SA 213 T11 + SA 213 T11	51 X 5.6	9
99	TUBE + TUBE	SA 210 GR.C + SA 213 T11	51 X 5	1
100	SC SPACER TUBES TUBE + TUBE	SA 213 T 22 + SA 213 T22	63.5 X 8	12
101	TUBE + TUBE	SA 213 TP 347 H + SA 213 TP 347 H	51 X 6.0	60
102	TUBE + TUBE	SA 213 T22 SA	63.5 X 8.8	12

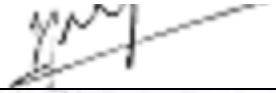
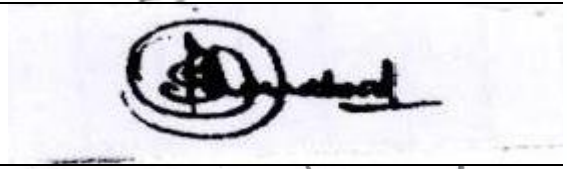
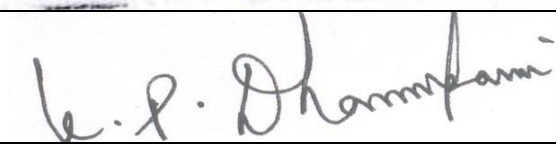
		213 T22		
103	RG PLUES WITH PIPES	SA 106 C + SA 105	--	24
104	PL FLGR HDR PIPE + PIPE	SA 106 GR C + SA 106 GR C	219.1 X 36	4
105	RG PLUGS WITH PIPES	SA 335 P12 + SA 182 F22	--	11
106	DC PIPE DRUM NOZZLE	SA 106 GR.C SA 105	368 X 38	6
107	DC PIPE DC PIPE	SA 106 GR.C SA 105	368 X 38	24
108	DC PIPE S.M. HDR	SA 106 GR.C SA 105	368 X 38	6
109	SM HDR SUCT.SPOOL	SA 234 WP C SA 106GR C	457.2 X 45	3
110	SUCT SPOOL CC PUMP	SA 106 GR C SA 234 WCB	457.2 X 45	3
111	CC PUMP DISC LINE	SA 234 WC B SA 515 GR 70	323.9 X 36.0	6
112	DISC LINE DISC LINE	SA 515 GR 70 SA 515 GR 70	323.9 X 36.0	6
113	DISC LINE BOTTOM HDR	SA 515 GR 70 SA 105	323.9 X 36.0	6
114	LOWER RING HEADERS	SA 515 GR 70 SA 515 GR 70	914.4 X 95.0	4
115	WW OUTLET HEADERS	SA 106 GR 70 SA 106 GR C	273.0 X 50.0	2
116	WW OUTLET HEADERS	SA 106 GR 70 SA 106 GR C	273.0 X 40.0	3
117	SUCTION MANI HDR	SA 106 GR.C SA 106 GR.C	508.0 X 55.0	1
118	ACID WASH CONNECTION	SA 106 GR.C SA 106 GR.C	127.0 X 20.0	1
119	RISER PIPES	SA 106 GR.C SA 106 GR.C	159.0 X 18.0	329
120	WW PANELS UCT.LCT	SA 210 GR.C SA 210 GR.C	51.0 X 5.6 51.0 X 6.0	6
121	WW PANELS UCT.LCT	SA 210 GR.C SA 210 GR.C	63.5 X 7.6	607
122	EXTD. SIDE WALL PANEL	SA 210 GR.C SA 210 GR.C	63.5 X 7.6	184
123	WW HANGE TUBES	SA 210 GR.C SA 210 GR.C	63.5 X 11.0	88
124	WW SCREEN TUBES	SA 210 GR.C SA 210 GR.C	63.5 X 7.6	498
125	REAR ARCH TUBES	SA 210 GR.C SA 210 GR.C	51.0 X 6.0	275
126	WW BOT HDR NIPPLES	SA 210 GR A1 SA 210 GR.C	51.0 X 6.0	1062
127	REAR ARCH TUBES	SA 210 GR.C SA 210 GR.C	63.5 X 7.1	36
128	REAR ARCH TUBES	SA 210 GR.C SA 210 GR.C	63.5 X 7.6	212

NOTE	
1.0	The number of joints indicated above is only tentative and meant for giving rough idea about the quantum of work. The joints are subject to any variation. No additional payment against variation in number of welding joints shall be entertained. Site routed

	small bore lines like HPBP oil pipings, drains, vents, etc are not included in this list.
2.0	The HP butt joints shown are applicable for (pressure parts) only.
3.0	The size, quantity & thickness indicated in the above schedule are preliminary and may undergo change and no additional payment is admissible on this account.
4.0	Only butt weld joints have been considered here. All applicable socket weld joints are included in the scope of work. No additional payment should be considered against socket welds.
5.0	All applicable joints under NPP shall be considered by bidder while quoting rates and quoted rate shall be inclusive of such. No additional payment whatsoever will be considered by BHEL in this regard for Group-NPP.

BHARAT HEAVY ELECTRICALS LIMITED
Tiruchirappalli - 620 014

PAINTING SCHEME FOR
SAGARDIGHI TPP–PHASE II-2 X 500MW-UNITS 3 &4
M/s. WEST BENGAL POWER DEVELOPMENT CORPORATION LTD;
SAGARDIGHI, MURSHIDABAD DIST., WEST BENGAL
CUSTOMER NO: U5/ 0(

Prepared by	**L. Gragori** **Manager / P. Lab**	
Reviewed by	**S.Dhanabal** **SDGM/PE / FB**	
Approved by	**Dr.K.P.Dhandapani** **AGM /P. Lab**	

N/ CHEM/CONTRACTS 09/SAGARDIGHI T

DEVELOPMENT CONSULTANTS PRIVATE LIMITED

Reviewed only for general conformance with Contract drawings and specifications.
Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents

ACTION: 2 **DATE:** 25.08.11

DISTRIBUTED BY:

1	Distributed	4	Approved except as noted. Resubmission required
2	Approved	5	Disapproved. See accompanying letter
3	Approved except as noted. Forward final drawing.	6	For information and record only

SEE COVERING LETTER

Letter Ref. No BHLTRY/0014 Date: 25.08.11

RECORD OF REVISIONS

Rev. No	Date	Details of revision	Remarks
00	**21-04-2011**	**NEW**	**Prepared in line with agreed resolutions of post bid discussion of Main Plant Package (SGMP2), Annexure-3 –Quality-Pages 75 to 80 of 335 held between 26th to 29th May,10, 09th June 10 and 16th to 18th June 10 at WBPDCL Corporate Office.**
01	**23-08-2011**	**A note has been added in Sl.No. 5.2**	**Note incorporated based on comments received from Consultant DCPL vide Shri. Dipak Sircar's mail Dt.20-08-11 to FB/Commercial.**

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
				Paint	No. of Coats / DFT	Paint	No. of coats	Paint	No. of coats	Shade	
1.1	1AC	Drum (Except Internals) **04** – 114, 116, 118, 124, 126, 128, 210, 212, 214, 270	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 / DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Inter-national Orange Shade No: 592 of IS 5	70
1.2	1AC	Drum Suspension **04** -142, 144, 146, 148	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1/ DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Inter-national Orange Shade No: 592 of IS 5	70
1.3	5	Drum Internals **04** – 134, 136, 138 Other Machined Components& All Retainers **43** – 101, 102, 103, 104, 105, 106, 107	SSPC-SP1 or SP3 Solvent / Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04	1 DFT=25µm per coat	--	--	--	--	--	25
1.4	1AE	Drum Transport Structures **04** - 194, 196, **35** - 391, 810	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Yellow Shade No: 356 of IS 5	70
2.1	11	Foundation Materials and Pin: **35** - 010, 011, 012, 013, 020, 030, 190 **38** – 010 **39** - 010, 011, 012, 020, 030, 040 48 – 019 & Columns below " 0 " level of PG 35,36, 38 & 39	- -	No Paint	- -	- -	- -	No Paint	- -	- -	- -

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
2.2	1J	Buck Stays and Structural Items: Buck stays **08** – 001, 003, 006, 007, 101, 104, 107, 111, 380, 382, 400, 500, 501, 503, 700, 900, 901, 904, 907, 910 Boiler Supporting Structures **35** – 100, 110, 111, 112, 120, 121, 122, 130, 131, 132, 133, 134, 135, 136, 140, 141, 142, 143, 144, 150, 151, 152, 153, 160, 161, 162, 171, 172, 173, 174, 181, 182, 183, 184, 185, 186, 191, 192, 193, 194, 195, 196, 210, 211, 212, 213, 214, 220, 221, 222, 230, 231, 232, 240, 250, 310, 311, 312, 320, 321, 322, 330, 331, 332, 340, 341, 342, 350, 351, 352, 360, 361, 362, 380, 381, 382, 383, 390,392, 410, 420, 430, 440, 441, 442, 443, 451, 452, 453, 461, 462, 463, 471, 472, 473, 481, 482, 483, 500, 510, 511, 512, 513, 514, 520, 521,522, 523, 524, 530, 531, 532, 533, 540, 541, 542, 550, 551, 552, 561, 562, 563, 571, 572, 573, 581, 582, 583, 591, 592, 593, 594, 595, 596, 597, 598, 599, 610, 612, 613, 710, 711, 712, 713, 715 **36** – 110,120, 130, 150, 200, 210, 211, 212, 220, 221, 222, 230, 231, 232, 240, 241, 242, 250, 251, 252, 260, 261, 262, 270, 271, 272, 280, 281, 282, 290, 291, 292, 300, 301, 302, 310, 311, 312, 313, 314, 315, 316, 320, 321, 322, 323, 324, 325, 326, 327, 330, 331, 332, 333, 334, 335, 340, 341, 342, 343, 344, 345, 346, 347, 348, 350, 351, 352, 353, 354, 355, 360, 361, 362, 363, 370, 371, 372, 380, 381, 382, 383, 390, 391, 392, 393, 394, 395, 396, 397, 410, 420, 430, 490, 491, 492, 510, 520, 610, 612, 620, 621, 630, 631, 632 **38** – 110, 120, 130, 210, 211, 299, 310, 311, 380, 381, 390, 410, 510, 511, 512, 513, 521, 522, 610, 611, 612, 620, 710, 712, 720, 730 **39** - 100, 101, 102, 110, 120, 121, 130, 140, 141, 142, 143, 150, 160, 200, 210, 300, 301, 303, 304, 305, 306, 311, 312, 323, 390, 391, 392, 393, 901 Duct Supports **48** – 005, 015, 025, 045, 055, 065, 085, 105, 115, 125, 145, 155, 185, 195, 200,205, 215, 225, 235, 245, 255, 265, 275, 295, 305, 315, 325, 335, 345, 355, 365, 375, 385, 415, 425, 435, 445, 455, 465, 475, 485, 495, 665, 805, 815, 825, 845, 855, 865, 875, 885, 995 Piping Centre: 80-800 to 882, 920 to 933, 940	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Smoke Grey Shade No: 692 of IS 5	100##

##- Out of two coats of finish paint, one coat will be applied at manufacturing centre and the 2nd coat will be applied after erection.

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
2.3	1J	Hangers: **36** - 740, 741, 742, 743, 744	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20µm per coat	Smoke Grey Shade No: 692 of IS 5	100
2.4	6	Hand Rails & Posts **35** - 850, 851 **36** - 850, 851, 852, 853 **38** - 850, 851 **39** - 850, 851	Hot dip Galvanizing to a coating weight of 610 gm per sq.m (minimum) and to a coating thickness of 85.0 microns (minimum).								
2.5	6	Floor grills, Guard plate** **35** – 811 **36** - 010, 810, 811, 812, 813, 814, 815, 816, 840 **38** - 810, 811 **39** – 810, 811, 840, 841	**Floor Grills: Hot dip Galvanizing to a coating weight of 610 gm per sq.m (minimum) and to a coating thickness of 85.0 microns (minimum).** ****** Guard plates, stringer channels will be painted as given in Sl. No. 2.2.								
2.6	6	*Ladders & Stairs **35** – 820, 821, 822, 823 **36** – 820, 821, 822, 823 **38** – 820, 821 **39** – 820, 830, 831 **48** - 466	Hot dip Galvanizing to a coating weight of 610 gm per sq.m (minimum) and to a coating thickness of 85.0 microns (minimum). *Hood Ladders will be painted as given in Sl. No. 2.2.								

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3.1	9/10	Components >95° C Un-insulated other than components coming in Gas Path **09** - 001, 002, 003 **21** - 800, 850, 875, 997 **24** – 120, 160, 173, 180, 185, 190, 195, 220, 260, 273, 280, 285, 290, 320, 345, 360, 373, 380, 385, 390, 395, 420, 460, 480, 485, 490, 495, 520, 560, 573, 580, 585, 590, 660, 680, 685, 690, 820, 860, 880, 885 **28** – 220 **42** – 300, 318, 328, 348, 358 **48** - 380	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Grade-I	1 (DFT =20 microns)	- -	- -	Heat Resistant Aluminium Paint to IS 13183 Grade-I	1 (DFT =20 µm per coat)	Aluminium	40
3.2	3	Components >95° C **Insulated** **05** - 137, 139, 147, 153, 154, 155, 158, 159, 175, 188, 195, 220, 227, 229, 231, 236, 241, 246, 251, 265, 281, 283, 296, 330, 340, 341, 350, 493, 879, 900 **07** - 101, 102, 104, 106, 107, 108, 109, 200, 201, 202, 203, 204, 211, 212, 214, 215, 216, 217, 218, 221, 222, 223, 225, 226, 229, 231, 232 **10** – 100, 120, 122, 135, 136, 140, 141, 151, 170, 174, 178, 179, 180, 191, 195, 218, 220, 222, 235, 236, 240, 241, 251, 270, 274, 278, 279, 280, 283, 284, 291, 295, 315, 687 **15** – 136, 138, 147, 174, 177, 192, 193, 236, 238, 274, 279, 292, 293, 999 **17** – 138, 177, 776, 807, 900, 903 **18** – 001, 002, 003, 010, 020 **19** – 701, 702, 753, 903 **21** – 600 **24** – 100, 115, 175, 200, 215, 275, 295, 300, 315, 375, 475, 500, 568, 600, 620, 675, **42** - 020, 021, 025, 030, 031, 032, 033, 036, 037, 038, 128, 150, 153, 158, 159, **48** –032,034,035,132,135,202, 204, 207, 208, 212, 214, 217, 221, 222, 224, 227, 228, 229, 232, 234, 242, 244, 252, 254, 261, 262, 264, 267, 272, 274, 276, 282, 284, 292, 294, 302, 304, 307,308, 309, 311, 312, 314, 318, 319, 322, 324, 332, 334, 342, 352, 362, 364, 372, 374, 381, 382, 384, 386, 388, 389, 392, 412, 414, 422, 424, 426, 432, 434, 438, 439, 442, 444, 452, 454, 462, 464, 467, 468, 469, 472, 474, 482, 484, 486, 487, 488, 489, 491, 492, 494, 496, 497, 498, 499, 602, 612, 622, 632, 646, 652, 654, 656, 662, 664, 666, 667, 668, 669, 676, 686, 696	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm per coat	-	- -	- -	- -	Red Oxide	60

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3.3	2	Heat Exchanger Coils: (SH, RH & Economiser Coils) **11** - 036, 037, 038, 074, 077, 078, 095, 135, 136, 138, 170, 174, 175, 178, 179, 235, 236, 237, 238, 248, 250, 251, 271, 272, 274, 275, 277, 278, 279, 280, 336, 337, 338, 340, 342, 356, 358, 370, 374, 377, 378, 395, 585, 587, 591, 606, 608, 616, 618, 682, 683, 684, 685, 686, 687, 688, 691, 694, 716, 717, 718, 767, 768, 769, 787, 791, 882, 883, 884, 885, 887, 916, 917, 918, 967, 968, 969, 986, 987, 988, 991, 994, 999 **12** – 135, 136, 170, 174, 178, 184, 187, 335, 395, 495, 515, 535, 551, 619, 800, 803, 805, 850, 851, 852, 900, 901, 903, 906, 914, 917, 924, 927, 928, 944, 948, 954, 968, 988, 999 **16** – 077, 079, 132, 235, 236, 237, 238, 256, 275, 277, 279, 281, 377, 379 **19** - 001, 104, 105, 114, 124, 184, 802, 814, 824, 884, 914, 924, 984	SSPC – SP2 or SSPC – SP3 Hand tool / Power tool cleaning	Red Oxide Zinc Phosphate Dip coat primer to PR: CHEM: 09 – 03	1 DFT= 35µm per coat	--	--	--	--	--	35
3.4	3	Components coming in Gas Path other than Coils **06** - 033, 036, 037, 041, 043, 046, 047, 052, 054, 089, 090, 091, 092, 093, 094, 130, 133, 136, 137, 141, 143, 146, 147, 152, 154, 189, 190, 191, 192, 193, 194, 231, 331, 350, 400, 430, 466, 467, 500, 530, 609, 611, 613, 614, 616, 620, 621, 623, 624, 630, 631, 633, 634, 636, 637, 639, 640, 641, 643, 644, 646, 647, 649, 650, 651, 652, 653, 654, 655, 657, 658, 659, 670, 689, 690, 691, 692, 693, 694, 695, 709, 713, 714, 715, 716, 720, 723, 730, 731, 733, 734, 737, 740, 741, 743, 744, 747, 749, 750, 751, 753, 755, 789, 790, 830, 840, 850, 851, 857, 895, 896, 897 **10** – 182, 183, 184, 185 **16** – 988, 999 **19** – 703, 704, 708, 763, 783, 850, 851, 900, 988, 999 **30** – 010, 104, 105, 211, 212, 215,216, 217, 218, 219, 220, 223, 227, 228, 233, 235, 993, **31** – 010,101, 102, 103, 104, 105, 108, 301, 993 **32** – 001, 002, 005, 006, 007, 008, 009, 011, 012, 021, 022, 023, 024, 025, 026, 027, 031, 033, 041, 042, 043, 044, 050, 055, 061, 073, 110, 120, 210, 620, 720, 810, 910, 993 **42** - 129	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm per coat	- -	- -	- -	- -	Red Oxide	60
3.5	8A	Uninsulated Fuel Pipes **47** – 229, 265, 266. 267, 268, 269 Duct for Tube Mill: **48** – 802, 804, 812, 814, 817, 822, 824, 832, 834, 842, 844, 852, 854, 857, 862, 864, 867, 872, 874, 882, 884,	SSPC-SP3/ Power Tool Cleaning	General purpose Aluminium paint to IS 2339	2	--	--	--	--	Alumunum	40
Sl.	Scheme	PGMA / Description	Surface	Primer coat		Intermediate Coat		Finish coat			Total

No.	No.		Preparation & Surface Profile	Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	DFT µm (min)
4	15	Constant Load and Variable Load Hangers (CLH / VLH)*** **(See NOTE 14)** **07** - 400, 401, 402, 403, 404, 405, 410, 420, 431 **10** - 200 **17** – 904, 906, 919, 929 **19** – 901, 904, 905, 906, 907 **24** - 346, 351	Abrasive blast cleaning to Sa 2 ½ 35- 50 microns	Epoxy zinc rich primer to IS 14589 Gr. II %VS=35 (min)	1 DFT=40 µm / coat	--	--	Aliphatic acrylic Poly-urethane paint %VS=40 (min) t	1 DFT=30 µm per coat	Phirozi Blue Shade No. 176 of IS5	70
5.1	1A	Miscellaneous and Casing Sheets: **07**-500, 501, 600, 601, 997, 999, **19** – 101, 102,**21** - 601, 987, **24** - 101, 125, 130, 135, 140, 201, 225, 230, 235, 240, 301, 325, 335, 340, 350, 370, 374, 400, 401, 425, 430, 435, 440, 470, 471, 473, 501, 525, 535, 540, 570, 601, 625, 635, 640, 800, 801, 815, 825, 987, 989, 996, 998 **35** - 994, 995, **36** - 613, 903, 999, **37** - 010, 110, 210, 310, 410, 510, 610, **39** - 302, 924 Fuel Firing: **41** – 100, 110, 200, 310, 320, 330, 340, 350, 390, 410, 420, 430, 450, 460, 470, 997 Steam Blowing Piping: **42** – 002, 003, 005, 010 **42** – 040, 045, 050, 055, 060, 065, 070, 111, 112, 113, 114, 118, 119, 120, 121, 122, 123, 124, 130, 131, 132, 151, 152, 154, 155, 156, 157, 160, 165, 170, 176, 180, 195, 196, 989, 997, 998 **43** – 000, 001, 002, 003, 004, 005, 006, 007, 008, 997, 999 **45** – 050, 120, 160, 161, 180, 181, 220, 221, 260, 261, 321, 325, 326, 401 **47** – 121, 122, 123, 124, 125, 129, 140, 141, 142, 143, 144, 145, 146, 149, 161, 162, 163, 164, 165, 169, 180, 181, 182, 183, 184, 185, 189, 200, 201, 202, 203, 204, 205, 209, 221, 222, 223224, 225, 241, 242, 243, 244, 245, 246, 247, 248, 249, 261, 262, 263, 264, 647, 648, 649, 650, 746, 953, 959, 963 Duct Plates and Expansion Joints: **48** – 002, 004, 007, 011, 012, 014, 017, 018, 022, 024, 028, 032, 034, 040, 042, 044, 052, 054, 062, 064, 066,072, 074, 082, 084, 092, 094, 102, 104, 107, 112, 114, 116, 122, 124, 132, 142, 144, 152, 154, 162, 172, 182, 184, 192, 194 Coal Handling: **65** – 051, 060, 070, 260, 402, 403, 460, 724, 736, 738, 786 **67** – 204, 251, 256, 261, 266, 271, 272, 276, 277, 283, 286, 400, 801, 802, 803, 804, 999 **99** – 201, 299	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30µm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Smoke Grey Shade No: 692 of IS 5	70
5.2	3	**Erection Materials and Commissioning Components: **04** - 988, **05**-993, **06**-993, **07** – 988, 993, **12**-993, **24** – 993, **28** – 993, **35** – 993, **36** – 993, **37** – 993, **38** – 993, **39** – 993, **48** – 988, 993, **65** – 988, **97**-585,**99** – 045, 099, 501, 502 ** NOTE: These erection materials or commissioning spares, if used, will be painted after erection depending upon the component location in the boiler and working temperature.	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30µm / coat	- -	- -	- -	- -	Red Oxide	60

***- The given scheme is applicable for Dus pertaining to CLH only. For other Dus, the applicable painting scheme shall be as per Sl.No. 5.1.

Sl.	Scheme	PGMA / Description	Surface	Primer coat	Intermediate Coat	Finish coat	Total

No.	No.		Preparation & Surface Profile	Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	DFT μm (min)
6.1	10	Cast carbon steel valves (Conventional) Cast alloy steel valves (Conventional) All API valves, QCNRV, SV & SRV Silencers, Water Level gauge HP / LP system 22-101,889	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.I	2	--	--	--	--	--	40
6.2	--	Forged valves	Phosphating	Coating weight of 1500 mg per sq.ft.	--	--	--	--	--	--	--
6.3	1AS	Soot Blower components 20-001,003,004,021,051,054,201,204,301,304,331,511,794,801,821,831,962,972	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30μm per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Verdigris Green Shade No. 280 of IS**5**	100

NOTES:

1. **This painting scheme covers a comprehensive list of PGMAs being used in 125 / 210 / 250 / 500/600 MW and Industrial Boilers under Fossil Boilers working in normal environment, in an effort to standardise the painting scheme. Therefore, the entire list of PGMAs will not be applicable for any specific project and only those PGMAs applicable for the project may be used, while choosing the painting scheme applicable.**
2. Rust Preventive coating should be given on HSFG Bolt & Nut threads.
3. All threaded & machined surfaces and all retainers 'A' & ''C' types are to be applied with a coating of Temporary Rust Preventive oil.
4. All surfaces of foundation materials, insulation pins, Anchor channels, Sleeves shall be coated with Temporary Rust Preventive Fluid and during execution of civil works; the dried film of coating shall be removed using organic solvents.
5. PGMAs under Sub-Vendor items are not indicated. Please refer respective Engineering Document for all sub-vendor items. Wherever it is not specified, it shall be as per the painting scheme of the applicable PGMA.
6. No painting is required for Aluminium, Stainless Steel components and galvanized items. Abrasive blast cleaning to SSPC-SP6 (Sa 2) grade shall be done to prepare the surface of hot worked pipes prior to application of primer.
7. Wherever **inside surfaces** of components under PGMA 48 – XXX, need protection till erection, and all running meter items for spares and main item two coats of Red-oxide zinc phosphate primer paint to IS12744 to a DFT of 60 microns shall be applied, after power tool cleaning. For items meant for Spares and subcontracting where no further processing is involved, the painting scheme selected shall be the same as that of similar product configuration/ description.
8. The Temporary Rust Preventive coating that has already been applied on any component, tubes, pipes etc., shall be visually inspected for good adherence. If the coating is intact, direct coating of alkyd based red oxide paints over the coating is permitted. In case, the coating has peeled off over a large area, then the coating is to be removed by suitable solvents / heating to 350 –400 °C for an hour before primer paint application –but, in this case, it should be ensured that the minimum surface cleanliness required for primer paint application shall be SSPC – SP2 (equivalent – Hand Tool cleaning).
9. **All currently active PGMAs are covered. Requirements for Missing / new PGMA s will be included under the relevant section, following the appropriate paint logic.**
10. Ground shade/colour finish paints & identification tag/ band for equipments, piping, pipe service, boiler supporting structures and other boiler components shall be followed as per tender.
11. In components, wherever plates/sheets of thickness less than or equal to 5 mm, tubes/ rods/drain pipe are used, power tool /hand tool cleaning to SSPC-SP3/ SSPC-SP-2 shall be followed and the painting shall be done as described in Sl no: 5.1.
12. Touch-up painting of damaged areas shall be carried out as per clause applicable painting scheme.
13. Only weldable primer shall be applied on surfaces, which require to be welded subsequently at site. At those locations no other paint shall be applied.
14. DUs coming under Constant Load Hangers (CLH) shall be painted as per the system - **PS 15** indicated in Sl. No. 4 of the table. However, for DUs coming under Variable Load Hangers (VLH), the painting shall be as per Painting Scheme PS 1A indicated in Sl. No. 5.1 of the table. (i.e., one coat of Red Oxide Zinc Phosphate Primer followed by two coats of Synthetic Enamel Paint –shade smoke grey, total DFT – 70 microns)
15. For internal protection of Pipes, tubes,headers and other pressure parts, Volatile Corrosion Inhibitor (VCI) pellets shall be put (after sponge testing/ draining/ or drying) and subsequently end capped. The dosage of VCI pellets shall be approximately 100 gm/ Cu..m. For tubes typically 4 – 5 tablets per end are to be put. For C & I items the dosage of self indicating Silica Gel (colourless) shall be 250 gm/ cu.m. (About 2 to 3 bags weighing approximately 100 grams each) . **VCI pellets shall not be used for stainless steel components and its composite associates.**
16. All threaded components of spring assemblies and turnbuckles shall be galvanized and achromatized to 15 microns minimum thickness.
17. Painting scheme for all temporary structures shall be PS 1AE i.e. 1 coat of Red oxide Zinc Phosphate primer (Alkyd Bse) to IS 12744-DFT-30 μ and 2 coats of Synthetic Enamel paint (Long Oil Alkyd) to IS 2932-DFT-2X20μ Shade Yellow –Shade No. 356 of IS 5- Total DFT 70μ.

Painting Scheme – Details for procurement & application purposes

Sl. No.	Material Code of Paint	Generic nature of paint	Theoretical Covering Capacity Sq. m per Litre	No. of pack	Volume solids, % (min) **	DFT in microns (min) per coat	Shade	Shade No. to IS5	Mode of appln.	Over coating interval, Hrs.
1	120016131800	Heat Resistant Aluminium paint to IS 13183 Grade I	10	1	-	-	Aluminium	--	Brush / Spray	24
2	120011111900	Red oxide Zinc Phosphate primer paint to IS 12744	10	1	--	--	Red Oxide	--	Brush / Spray	12
3	120011121900	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	--	--	Red Oxide	---	Dip	12
4	120011311200	Long oil alkyd synthetic enamel finish paint to IS2932	10	1	--	--	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
5	120011140000	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	--	--	Amber	--	Brush / Spray	12
6	120012141700	Epoxy Zinc rich primer to IS14589 Gr. II	8	2	35	40	Grey	--	Spray	24
7	120013310200	Aliphatic acrylic polyurethane paint to IS13213	10	2	40	30	Phirozi – Blue./French Blue	176/166	Spray	24
8	120017101800	De Oxy Aluminate Weldable Primer- Colour Aluminium	10	1	--	--	Aluminium	--	Brush / Spray	24

The covering capacity of paints specified is only approximate. The paints and Rust Preventive fluid shall be procured from BHEL's approved suppliers. ** Values are indicative.

RANIPET	Painting schedule for APH ESP FAN and Gates & Damper for SAGARDIGHI 2X500 MW , Phase II Unit 3 &4, WEST BENGAL POWER DEVELOPMENT CORPORATION LTD,(BHEL RPT WORK ORDER NO. R547, R548)	PS SAGARDIGHI R547-R548 Rev 01 DT 24 09 2011
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SL NO.	Description	Surface preparation	Primer/ DFT	Intermediate DFT	Finish DFT	Total DFT
1.0	Insulated and Flue gas surfaces of APH, ESP FAN	Power Tool Cleaning to St3 (SSPC-SP3)	Two coats of Red oxide Zinc phosphate primer as per IS 12744 DFT 2x30 =60 μm (min)	NIL	NIL	60 μm (min)
2.0	All surfaces of Gates and Dampers	Power Tool Cleaning to St3 (SSPC	Two coats of Heat resistant Aluminum paint as per IS13183 Gr. II DFT 2x20 =40 μm (min)	NIL	NIL	40 μm (min)
3.0	Surfaces exposed to Atmosphere of APH ESP FAN	Power Tool Cleaning to St3	Two coats of Red oxide Zinc phosphate primer as per IS 12744 DFT 2x30 =60 μm (min)	NIL	Two coats of Synthetic enamel as per IS 2932 **Shade-GREY** 692 OF IS 5 DFT 2x20=40μm (min)	100μm (min)
4.0	Floor grills, Step treads, Hand rails, Post of ESP(7X X65,89 610,89 611) and Gates & Dampers (57 466)(**)	Hot dip Galvanizing to 610gms/SQ. M to a coating thickness of 85 microns (min)				
5.0	Items other than of above PG MA of ESP (7X-X65, 89 610, 89 611) and Gates & Damper (57 466)	Power Tool Cleaning to St3	Two coats of Red oxide Zinc phosphate primer as per IS 12744 DFT 2x30 =60 μm (min)	NIL	Two coats of Synthetic enamel as per IS 2932 **Black Shade** DFT 2x20=40μm (min)	100μm (min)
6.0	Foundation materials of, Fan ESP, collecting electrode, Shims of ESP, All machined Components, Gate Blades	Temporary rust preventive (Dry type)				
7.0	Heating elements of APH	Dipped in Rust preventive oil (Non dry type)				

(**) Items referred in SL. No. 4 for galvanizing is inactive only. Actual shall be as per Drawing/GMS

Notes

1. Painting of APH ESP, Fan and G&D commissioning spares and Mandatory spares shall be as per respective ite
2. No painting for SS, Aluminum and Galvanized items.
3. All components covered under different PGMAs are to be painted. Incase any component is left out; the s relevant section.

Record of revision	Rev 00 DTD 06 06 2011 Original Issue
	Rev 01 DTD 24 09 2011 revised based on customer comments

Prepared by	Reviewed an

DEVELOPMENT CONSULTANTS PRIVATE LIMITED

Reviewed only for general conformance with Contract drawings and specifications.
Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents

ACTION: 2 **DATE:** 12/10/11

DISTRIBUTED BY:

1	Distributed	4	Approved except as noted. Resubmission required
2	Approved	5	Disapproved. See accompanying letter
3	Approved except as noted. Forward final drawing.	6	For information and record only

SEE COVERING LETTER

Letter Ref. No BHLBAP/0067 Date: 12/10/11

VOLUME-III
PRICE SCHEDULE, REV-1
(PACKAGE-A)

Erection, testing, commissioning etc of boiler & auxiliaries, etc of 1x500 MW unit # 3 for 2x500 MW units at Sagardighi STPP, WB.

TENDER NO - PSER:SCT:SDG-B1306:12

PREAMBLE

1.0	This preamble forms part of tender document and schedule of items. The bidder should read this preamble carefully in rates for various items. Clauses under this preamble shall be read in conjunction with various volumes of tender as per NIT together with subsequent changes/ modifications etc thereto as applicable as on date of submission of price offer.
2.0	The work shall be carried out strictly as per specifications, description of the items in these schedule and/ or engineer's instructions.
3.0	Items of work provided in this schedule but not covered in this specification shall be executed strictly as per instruction of the engineer.
4.0	Unless specifically mentioned otherwise in the tender, the bidder shall quote for the finished items and shall provide for the complete cost towards power, fuel, tools, tackles, equipment, constructional plants, temporary works, labour, dismantling of all temporary piping, structures, valves, pumps, tanks & other misc. equipment, strengthening of roads/ culverts/ bridges etc including arranging all clearances etc required for carrying out different activities & tests, materials, levies, taxes, transport, layout, repairs, rectification, maintenance till handing over, supervisions, colonies, shops, establishments, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the work according to the tender and this schedule.
5.0	Unless otherwise specified & except for tender on lumpsum basis, for all item rate based tenders, the quantities of the various items mentioned in price schedule are approximate, based on very preliminary information and may vary to any extent or to be deleted altogether. The quoted/ accepted rates shall remain firm and valid as long as variation in total value of work executed under this contract including extra items, but excluding any price escalation/ PVC, remains within +/- 20% (Twenty percent) of the contract price given in the LOI/ WO.
6.0	The rates quoted shall be inclusive of cleaning of site of any vegetation, dressing and leveling etc including fixing of grid pillars, benchmarks etc required for commencement of site activities. No separate payment will be made towards the same.
7.0	Rates shall be quoted in figures and in words in clear legible writing. No overwriting is allowed. All scoring and cancellations should be countersigned and in case of illegibility the interpretation of engineer shall be final. All entries shall be in English language.
8.0	All works item wise shall be measured upon completion and paid for at the rates quoted and accepted.
9.0	The tender shall be deemed to have studied the specifications, details of work to the done within the time schedule attached and to have acquainted himself of the conditions prevailing at site.
10.0	Engineer's decision shall be final and binding on the contractor regarding clarification of items in the schedule with respect to the other sections/ volumes of the contract.
11.0	Evaluation & awarding will be done seperately on PACKAGE-A & PACKAGE-B. PACKAGE-A shall be decided first and who-so-ever is successful in PACKAGE-A shall not be considered for PACKAGE-B (They will not be considered for Reverse Auction/ price bid opening of PACKAGE–B).

VOLUME-III
PRICE SCHEDULE, REV-1
(PACKAGE-A)

Erection, testing, commissioning etc of boiler & auxiliaries, etc of 1x500 MW unit # 3 for 2x500 MW units at Sagardighi STPP, WB.

TENDER NO - PSER:SCT:SDG-B1306:12

RATE SCHEDULE

SL NO	DESCRIPTION OF ITEM	QUANTITY (a)		UNIT RATE (Rs) (b)	AMOUNT (Rs) (a x b)
1.0	Group-I (Pressue part).	4762	MT		
2.0	Group-II (Intergral and trim piping).	375	MT		
3.0	Group-III (Non-pressure part).	12102	MT		
4.0	Group-IV (Rotating machines).	3290	MT		
5.0	Group-V (ESP).	8774	MT		
6.0	Group-VI (Piping etc).				
6.1	P-91 piping along with associated valves and other fittings like flow nozzle, orifice, traps, thermowell, strainer, etc.	275	MT		
6.2	Other alloy steel piping along with valves and other fittings like flow nozzle, orifice, traps, thermowell, strainer, etc.	277	MT		
6.3	Carbon steel piping along with valves and other fittings like flow nozzle, orifice, traps, thermowell, strainer, etc.	607	MT		
6.4	Hangers & support, structures.	602	MT		
7.0	Fabrication & erection of boiler structure including miscellaneous approach/ operating platform (Material shall be supplied by BHEL free of cost).	200	MT		
8.0	Group-VII (Insulation).	2801	MT		
9.0	Providing manpower assistance along with requissite tools, etc for conducting PG test.	50	MAN-MTH		
10.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of various LP piping system (DMCW, lub oil etc - for dia below 700 NB carbon steel piping) and associated material (including fitting and valves etc) as per tender.	15	MT		
11.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioing of carbon steel drinking water (up to 150 NB) and service water system (up to 350 NB) piping system and associated material (including fitting and valves etc) as per tender.	15	MT		
12.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning (as per scope), testing & commissioning of SS (stainless steel) LP piping system (condensate transfer/ DMCW etc of dia up to 350 NB) and associated material (including fitting and valves etc) as per tender.	10	MT		
13.0	Handling from storage, erection, welding/ jointing, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of instrument air and service air system (up to 150 NB galvanised & threaded) and associated material (including fitting and valves etc) as per tender.	10	MT		
TOTAL					

NOTES

SL NO	DESCRIPTION OF ITEM	QUANTITY (a)	UNIT RATE (Rs) (b)	AMOUNT (Rs) (a x b)
1.0	Bidder's quoted total price above shall be taken into account for evaluation and awarding and hence, shall be complete in all respect for the full scope defined in specification and in accordance with all terms & conditions of tender.			
2.0	For details of PGs covered under different groups, please refer to relevant annexure of tender.			
3.0	Besides above product group, there is likelihood of addition of new PG under the above group heads due to release of some items integral to boiler & aux. The quoted rates shall be applicable for such PGs also within the stipulated variation limit.			
4.0	Any item as per scope of work if not included in the price quoted above and shown separately will not be taken into cognizance and the offer shall be liable for rejection.			
5.0	Price format shall not be changed by bidder in any case, since it may lead to cancellation of offer.			

VOLUME-III
PRICE SCHEDULE, REV-1
(PACKAGE-B)

Erection, testing, commissioning etc of boiler & auxiliaries, etc of 1x500 MW unit # 4 for 2x500 MW units at Sagardighi STPP, WB.

TENDER NO - PSER:SCT:SDG-B1306:12

PREAMBLE

1.0	This preamble forms part of tender document and schedule of items. The bidder should read this preamble carefully in rates for various items. Clauses under this preamble shall be read in conjunction with various volumes of tender as per NIT together with subsequent changes/ modifications etc thereto as applicable as on date of submission of price offer.
2.0	The work shall be carried out strictly as per specifications, description of the items in these schedule and/ or engineer's instructions.
3.0	Items of work provided in this schedule but not covered in this specification shall be executed strictly as per instruction of the engineer.
4.0	Unless specifically mentioned otherwise in the tender, the bidder shall quote for the finished items and shall provide for the complete cost towards power, fuel, tools, tackles, equipment, constructional plants, temporary works, labour, dismantling of all temporary piping, structures, valves, pumps, tanks & other misc. equipment, strengthening of roads/ culverts/ bridges etc including arranging all clearances etc required for carrying out different activities & tests, materials, levies, taxes, transport, layout, repairs, rectification, maintenance till handing over, supervisions, colonies, shops, establishments, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the work according to the tender and this schedule.
5.0	Unless otherwise specified & except for tender on lumpsum basis, for all item rate based tenders, the quantities of the various items mentioned in price schedule are approximate, based on very preliminary information and may vary to any extent or to be deleted altogether. The quoted/ accepted rates shall remain firm and valid as long as variation in total value of work executed under this contract including extra items, but excluding any price escalation/ PVC, remains within +/- 20% (Twenty percent) of the contract price given in the LOI/ WO.
6.0	The rates quoted shall be inclusive of cleaning of site of any vegetation, dressing and leveling etc including fixing of grid pillars, benchmarks etc required for commencement of site activities. No separate payment will be made towards the same.
7.0	Rates shall be quoted in figures and in words in clear legible writing. No overwriting is allowed. All scoring and cancellations should be countersigned and in case of illegibility the interpretation of engineer shall be final. All entries shall be in English language.
8.0	All works item wise shall be measured upon completion and paid for at the rates quoted and accepted.
9.0	The tender shall be deemed to have studied the specifications, details of work to the done within the time schedule attached and to have acquainted himself of the conditions prevailing at site.
10.0	Engineer's decision shall be final and binding on the contractor regarding clarification of items in the schedule with respect to the other sections/ volumes of the contract.
11.0	Evaluation & awarding will be done seperately on PACKAGE-A & PACKAGE-B. PACKAGE-A shall be decided first and who-so-ever is successful in PACKAGE-A shall not be considered for PACKAGE-B (They will not be considered for Reverse Auction/ price bid opening of PACKAGE–B).

VOLUME-III
PRICE SCHEDULE, REV-1
(PACKAGE-B)

Erection, testing, commissioning etc of boiler & auxiliaries, etc of 1x500 MW unit # 4 for 2x500 MW units at Sagardighi STPP, WB.

TENDER NO - PSER:SCT:SDG-B1306:12

PREAMBLE

1.0	This preamble forms part of tender document and schedule of items. The bidder should read this preamble carefully in rates for various items. Clauses under this preamble shall be read in conjunction with various volumes of tender as per NIT together with subsequent changes/ modifications etc thereto as applicable as on date of submission of price offer.
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VOLUME-III
PRICE SCHEDULE, REV-1
(PACKAGE-B)

Erection, testing, commissioning etc of boiler & auxiliaries, etc of 1x500 MW unit # 4 for 2x500 MW units at Sagardighi STPP, WB.

TENDER NO - PSER:SCT:SDG-B1306:12

RATE SCHEDULE

SL NO	DESCRIPTION OF ITEM	QUANTITY (a)		UNIT RATE (Rs) (b)	AMOUNT (Rs)
1.0	Group-I (Pressue part).	4762	MT		
2.0	Group-II (Intergral and trim piping).	375	MT		
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5.0	Group-V (ESP).	8774	MT		
6.0	Group-VI (Piping etc).				
6.1	P-91 piping along with associated valves and other fittings like flow nozzle, orifice, traps, thermowell, strainer, etc.	275	MT		
6.2	Other alloy steel piping along with valves and other fittings like flow nozzle, orifice, traps, thermowell, strainer, etc.	277	MT		
6.3	Carbon steel piping along with valves and other fittings like flow nozzle, orifice, traps, thermowell, strainer, etc.	607	MT		
6.4	Hangers & support, structures.	602	MT		
7.0	Fabrication & erection of boiler structure including miscellaneous approach/ operating platform (Material shall be supplied by BHEL free of cost).	200	MT		
8.0	Group-VII (Insulation).	2801	MT		
9.0	Providing manpower assistance along with requissite tools, etc for conducting PG test.	50	MAN-MTH		
10.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of various LP piping system (DMCW, lub oil etc - for dia below 700 NB carbon steel piping) and associated material (including fitting and valves etc) as per tender.	15	MT		
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SL NO	DESCRIPTION OF ITEM	QUANTITY (a)	UNIT RATE (Rs) (b)	AMOUNT (Rs)
TOTAL				
NOTES				
1.0	Bidder's quoted total price above shall be taken into account for evaluation and awarding and hence, shall be complete in all respect for the full scope defined in specification and in accordance with all terms & conditions of tender.			
2.0	For details of PGs covered under different groups, please refer to relevant annexure of tender.			
3.0	Besides above product group, there is likelihood of addition of new PG under the above group heads due to release of some items integral to boiler & aux. The quoted rates shall be applicable for such PGs also within the stipulated variation limit.			
4.0	Any item as per scope of work if not included in the price quoted above and shown separately will not be taken into cognizance and the offer shall be liable for rejection.			
5.0	Price format shall not be changed by bidder in any case, since it may lead to cancellation of offer.			

ANNEXURE - 2

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	(i)PACKAGE-A: Erection, testing, commissioning etc of Boiler & Auxiliaries of 1X500 MW Unit#3 for 2x500 MW units at Sagardighi STPP,WB and (ii)PACKAGE-B: Erection, testing, commissioning etc of Boiler & Auxiliaries of 1X500 MW Unit#4 for 2x500 MW units at Sagardighi STPP,WB.	
Ref	1.0	Tender no PSER:SCT:SDG-B1306:12
	2.0	BHEL's NIT, vide reference no PSER:SCT:SDG-B1306:2679,dated 24-01-2012.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:SDG-B1306:TCN-01,dated 13-02-2012.
	4.0	BHEL's TCN-02, vide reference no PSER:SCT:SDG-B1306:TCN-02, dated 15-02-2012.
	5.0	Other references (if any).

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
representative of the bidder)