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

TCN - 02

Ref: PSER:SCT:NBN-B1900:TCN-02 Date: 08/06/2018

Sub	Tender change notice (TCN) 02	
Job	Erection, testing, commissioning, etc of the balance works of Boiler & auxiliaries of 1 x 250 MW Unit-4 for 4x250MW BRBCL Nabinagar TPP, Bihar.	
Ref	1.0	Tender no PSER:SCT:NBN-B1900:18
	2.0	BHEL's NIT, vide reference no PSER:SCT:NBN-B1900:6785 Date: 15-05-2018
	3.0	BHEL's TCN-01 , vide reference no PSER:SCT:NBN-B1900:TCN-01 dated 04-06-2018
	4.0	All other pertinent issues till date.

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

1.0 Revised SCT-NBN-B1900-VOL-IF-TCC-CML-R-01 superseding SCT-NBN-B1900-VOL-1F-TCC-CML-R-00 issued earlier with NIT .

2.0 Revised `No deviation certificate' as per enclosed Annexure-2. Bidder shall submit no deviation certificate as per enclosed format only.

3.0 All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HYEAVY ELECTRICALS LTD

Dy Mgr (SCT)

Encl : As above.

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091
फैक्स/Fax : (033) 23211960 फोन/Phone : बोर्ड/EPABX : 23211691, 23211798, 23211796

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

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	4.0	BHEL's TCN-02, vide reference PSER:SCT:NBN-B1900:TCN-02, dated 08-06-2018.
	5.0	All other pertinent issues till date.

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, integrity pact (if applicable) 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)

TENDER NO.	PSER:SCT:NBN-B1900 :18
VOLUME-1F-R01	TECHNICAL SPECIFICATION AND SPECIAL CONDITIONS OF CONTRACT

INDEX

CLAUSE NO	DESCRIPTION
1.0	**PROJECT SYNOPSIS AND GENERAL INFORMATION**
	NTPC (for BHARATIYA RAIL BIJLEE COMPANY LTD.) is setting up four units of 4x250 MW Thermal Power station (coal based) at Nabinagar, District- Aurangabad, State of Bihar. The Plant site is located at North: 24 deg. 42' 30" (N) and East: 84 deg. 05' 36" (E). Nearest Railway station is Dehri-On-Sone which is approx. 30 KM away from the project site. The nearest major town Aurangabad is located at a distance of about 50 Kms. from Project site. **Nearest Railway Station : Dehri-On-Sone Railway Station (Approx. 30 KMs from the Plant)** **Nearest Airport : Gaya (Approx. 100 KMs from the Plant)** Nearest Highway is National Highway-2 which is 25KM away from the project site.
2.0	**SCOPE OF ENQUIRY**
	The steam generator is having natural circulation, drum type, double pass, water tube, corner fired with tilting type burners using pulverized coal, single reheat, suitable for outdoor installation
2.1	The intent of this erection specification of BRBCL Nabinagar **250 MW Boiler Unit #4** is to provide services for execution of the project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services / facilities to complete the work or portion of work awarded to him. The quoted / accepted rates / price shall deem to be inclusive of all such contingencies.
2.2	This specification covers the complete work of handling including arranging the issue of material, receipt from store/ yard, transportation to site, temporary storage prior to erection, if required, cleaning, preservative painting, erection, alignment, welding, leveling, adjustment, heat treatment, NDT, welding of hooks, seal-plates etc., hydraulic test, insulation, chemical cleaning, all pre-commissioning tests, start-up and trial run of individual equipment, final commissioning, finish painting and trial run **of the balance works of Boiler & auxiliaries of 1 x 250 MW Unit-4 of 4x250MW BRBCL Nabinagar TPP** up to handing over of the unit to BHEL/ BRBCL 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 and 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.
2.3	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.
2.4	The omission of specific reference to any fabrication / erection method, equipment or material necessary for proper and efficient working of the plant shall not relieve the tenderer 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 vendor free of cost. Inspection by BHEL/Customer does not relieve vendor of his responsibility of executing quality erection.
2.5	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.
2.6	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.
2.7	The boiler shall be erected as per relevant provisions of latest Indian boiler regulations and amendments / addendums thereof, if any.
2.8	Following shall be the responsibility of contractor and have to be provided within finally accepted rates / prices:
2.8.1	Provision as required of all types of labour, supervisors, engineers, watch and ward, tools & tackles, calibrated IMTEs (Inspection, measuring and testing equipment) as specified and otherwise required for the work, consumables for erection, testing and commissioning including material handling.
2.8.2	Achieving Proper out-turn / Turn-over as per BHEL plan and commitment.
2.8.3	Completion of work as per BHEL Schedule.
2.8.3	Good quality and accurate workmanship for proper performance of the equipment.
2.8.4	Repair and rectification.
2.8.5	Preservation / Re-conservation of all components during storage / erection / commissioning till handing over.
2.9	The work to be carried out under the scope of this specification shall broadly comprise of but not to be limited to the following:
2.10	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 up to 50 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 drum lifting winches shall be cast by the contractor using his own materials at his cost as per the sketches provided by BHEL engineer. 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, column base encasings, equipment base plates, anchor bolt holes etc are included in the scope. The grouting mixture shall be composed either of port land cement or ready mix grout of proven quality. **However, in both the cases Vendor has to supply portland cement and ready mix grout component respectively within his quoted rate**. 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 approved laboratory at his cost. Test cube shall also be taken during grouting for testing in the laboratory and shall be

	tested at his cost.
2.11	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.
2.12	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.
2.13	deleted
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 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.
2.15	It shall be the responsibility of the contractor to provide ladders on columns for initial work till such time stairways are completed. For this, the ladder should not be welded on the column and should be pre-fabricated clamping type ladders. No temporary welding on any structural member is permitted except under special circumstances with the approval of BHEL. In case it is necessary then the contractor shall cut the temporary structure and rectify the column as directed by the engineer.
2.16	The contractor is strictly prohibited in using the Boiler / Auxiliary Components for any temporary supporting or scaffolding works etc. In case of such misuse a sum of as determined by Engineer will be recovered from contractor's bills.
2.17	Suspensions for ducting will be supplied in running lengths, which shall be cut to size and adjusted as required. Ducts / expansion bellows are dispatched to site in loose walls plates / pieces and these are to be assembled and welded at site along with stiffeners etc., before erection within the finally accepted rates. All joints connecting duct expansion piece and dampers shall be seal welded on inside as well as on outside.
2.18	The headers are provided with hand holes. The contractor, shall as per requirement, carry out removal and re-fixing of hand hole plates within finally accepted rates.
2.19	Burner tilt mechanism will be checked for freeness, serviced and adjusted, if necessary to obtain optimum tilt before installation.
2.20	Contractor shall carry out kerosene testing of all bearing housings of various rotating equipment like pumps, fans etc., as per BHEL engineer's instructions. Performance of hydro test of oil coolers of rotating machines and hydro test of SCAPH and other equipment as per BHEL engineer's instructions is included in the scope of work.
2.21	Certain rotating machinery after initial runs and commissioning of the equipment have to be hot aligned as per the instructions of BHEL engineer. Cleaning air pre-heater, fans, boiler ducting etc., free of extraneous steel, scaffolding materials electrodes, all foreign materials etc., before trial run of rotating machinery, and at various stages of pre-commissioning activities as per BHEL engineer's instruction, is within the scope of work.
2.22	Some of the rotating equipment and electrical motors are provided with protective greases only. Contractor shall arrange for cleaning of the same with kerosene or some other reagent. If necessary, dismantling some of the parts of the equipment would be necessary. He shall arrange for re-greasing / lubricating them with

	recommended lubricants and for assembling back the dismantled parts, within their finally accepted quoted price. No additional payment shall be made for such type of work. **Lubricating Oil will, however, be supplied free of cost by BHEL.**
2.23	The contractor shall fabricate pipe, special bends etc., threading and welding as required for installing lube oil system and carry out the acid cleaning of the fabricated piping. The contractor shall also service the lube oil system, carrying out the hydraulic test of oil coolers etc
2.24	Erection of Ceralin tiles, their glue application, fixing of weld plugs and their welding for the tube mills is to be carried out by contractor at no extra cost to BHEL.
2.25	Packer plates supplied may have to be machined to the correct dimensions. It may also be necessary to blue match the same with each other/ with equipment / with foundations as per BHEL instructions.
2.26	Contractor shall arrange changing of preservative oil in the gearboxes, journal and other bearing assemblies of rotating equipment when in storage areas or after erection of equipment as the case may be as per the instructions of BHEL engineer. Necessary lubricating oil will be supplied by BHEL and the same will be drawn by contractor from BHEL / customer's stores and transporting to site. **No additional payment will be made for such works** even though supply of lube oil might have been made under regular despatchable unit (DU) number against product group main assembly (PGMA) and appearing in the shipping list. Prior to the commissioning of the equipment, oil should be drained and collected in drums provided by BHEL and returned to BHEL / customer's stores.
2.27	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.
2.28	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.
2.29	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.
2.29.1	For this last unit of the project, various types of pressure part / Piping items are available without proper identification marking. Such items may have to be done PMI test as per requirement of BHEL/BRBCL. Bidder's quoted rate shall be inclusive of this cost.
2.30	Suspension for ducting, piping, etc. will be supplied in running lengths which shall be cut to suitable sizes and adjusted as required secondary steel for hangers etc shall be supplied by BHEL. Ducts/expansion bellows are likely to be despatched to site in walls/plate/loose pieces and those are to be assembled and welded at site, before erection. This involves intensive seal welding / full welding on ducts and same shall be included in the scope of work of the contractor.
2.31	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 recognised body and certificate is to be submitted to BHEL.
2.32	Complete penetration of water wall (Panel to Panel) welding shall be achieved either by one side or both sides welding.
2.33	All the motors and equipment shall be suitably doweled after alignment of shafts with taper / parallel machined dowels as per the direction of the Engineer. Dowel pins required are be machined by the contractor at his own cost. However the materials for dowel pins shall be issued by BHEL free of cost.
2.34	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.
2.34	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 wherever instructed by BHEL Engineer.
2.35	The HT motor bearings shall be blue matched at site and checked for bearing clearances. The contractor if required shall carry out scraping of bearing housing. No extra claim for blue matching up to 1mm initial gap will be entertained.
2.35	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.
2.36	Certain instruments like pressure gauges, pressure transmitters, temperature gauges, flow switches and indicators, etc., are received in assembled condition as integral part of equipment. Contractor shall be responsible for safe receipt, installation and custody of these instruments supplied mounted on skids / equipment. BHEL will get these instruments calibrated. The contractor for this scope of work shall assist and co-ordinate for the same with the agency engaged by BHEL to calibrate such instruments.
2.37	Contractor shall install piping in such a way that no excessive or destructive expansion forces exists in either the cold condition or under conditions of maximum temperature and pressure. All bends, expansion joints and any other special fittings necessary to take care of proper expansion shall be incorporated as per the advice of Engineer. During installation of expansion joints, anchors, care must be taken to see that full design movement is available at all times from maximum and minimum temperature.
2.38	The hanger assemblies shall not be used for attachment of rigging to hoist the pipes into position. Other means shall be used to securely hold the pipe in position till pipe supports are completely assembled and attached to the pipe and building structure.
2.39	The contractor shall carry out the tightening of the field bolts on the equipment and piping covered under this specification by using either the calibrated torque wrench method or the turn of part method. The methods used the tools and the equipment deployed shall be subject to the approval of Engineer. The competent technicians shall carry out the bolting work.
2.40	The commissioning of all pneumatic actuators is excluded from the scope of this contract. However assistance in mechanical work associated with the commissioning power cylinders, valves, valve actuators etc., coming under various groups shall be provided by contractor within the finally accepted rates. The contractor may have to draw the materials. Any damage / loss in their custody will be the contractors account.
2.41	The erection of all pneumatic power cylinders for the burner-tilt mechanism and SADC is included in the scope of this contract**.** Assistance in mechanical work

	associated with the commissioning power cylinders, valves, valve actuators etc., coming under various groups shall be provided by contractor within the finally accepted rates.
2.42(a)	The Erection, testing and commissioning of all electrically operated valves, actuators and dampers is covered within the scope of this specification.
2.42(b)	The Structural Job of making Platform, Pedastal, Ladder etc to facilitate installation of Open type /Close type Instrument Rack and approach to Instrument Tapping are included in the scope of this contract. However Structural Materials shall be provided by BHEL on free of cost.
2.43	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.
2.44	The contractor shall install as part of the work at unit rate of non-pressure parts for erection of all platforms ladders , and approaches wherever required to facilitate operation of equipment/instrument but not specifically shown in the drawings/bill of materials. However raw materials for the same shall be provided by BHEL.
2.45	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.
2.46	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.
2.47	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 even if:
2.47.1	Product groups (PG) under which these items are released are covered in the scope of this tender.
2.47.2	Items supplied by an agency other than BHEL are covered in the scope of this tender..
2.48	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 un-cleaned and untested.
2.49	The contractor shall bend, cut, prepare ends and route the pipes as per the equipment layout, for the pipes which shall be supplied in random straight length. The contractor shall complete the terminal joint at either ends for all the piping schemes covered in this scope of work.
2.50	Installation of all supports and hangers including concreting or welding of these supports as necessary, required for piping in this scope of work have to be carried out by the contractor.

2.51	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. Adjustment of all hangers supports erected and providing cold pull in the piping wherever required is included in the scope of the contractor.
2.52	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. However in case the contractor is required to supply it , they are asked to quote separately the unit rate of supplying the same.
2.53	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.
2.54	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.
2.55	All drain points shall be laid by the contractor to the drain pit as advised by BHEL Engineer, as part of the scope of work.
2.56	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.
2.57	All the flap valves, dampers of ducts shall be serviced and lubricated to the satisfaction of BHEL Engineer, before erecting the same.
2.58	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.
2.59	In case of any class of work for which there is no such specification laid down in this specification but subsequently given in the drawing released by manufacturing unit, 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.
2.60	All lifting tackles including wire-ropes slings, shackles, used by the contractor including that supplied by BHEL, 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.
2.61	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 Vendor should submit `AS-BUILT' drawings with RTF for necessary record.
2.62	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.
2.63	All site-fabricated pipes will be issued in running meters 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.
2.64	For some low pressure application system, Piping covered under various drains & vents, various fittings like bend, Tee etc. need to be fabricated at site from the supplied straight lengths though their sizes are greater than 2'' (Two inches). No separate price for such fabrication will be entertained by BHEL and this is to be done by the Vendor within his quoted rate / price.
2.65	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.
2.66	Pulverised fuel piping from coal mill / Mill discharge valve outlet up to burner with necessary supports and fittings.
2.67	The air heater baskets have to be thoroughly cleaned by compressed air and preservative to be spread as part of responsibility of the contractor.
2.68	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. No temporary supports shall be welded on the pressure parts or piping. Welding of temporary supports, cleats etc on the boiler 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.
2.69	The contractor shall carry out the trial run of motors including checking of the direction of rotation in the uncoupled condition, checking alignment and re-coupling the motor to their respective driven equipment. Before starting the motor IR Value of the motor shall be recorded and if found necessary dry out operation shall be carried out by the contractor to make up the IR Value to normal, as per the advice of BHEL Engineer within the quoted rate.
2.70	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.
2.71	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.

2.72	All piping coming under the purview of IBR is included in Bidder's Scope. The contractor shall arrange / organize for stage inspection of Boiler/IBR Components by Statutory Authority/Boiler Directorate. It will be the sole responsibility of the Vendor to arrange visit of the inspecting authority for conducting stage inspection of the components based on the Drawings / documents supplied by BHEL. Vendor is also expected to carry out the liaison work for expediting the process of Lay-out drawing approval by State Boiler Directorate. Obtaining statutory clearance for IBR component is the responsibility of the vendor. For this purpose, prepared IBR documents what-so-ever for the erected items shall be handed over by BHEL. Any left-over IBR documentation and clearances for the already erected items till handing over to Customer is also covered under the scope of Bidder and therefore it is requested that bidders may assess this scope of work involvement prior to quoting their rates for the respective items. Only technical clarification, if required during drawing approval or inspection, will be extended by BHEL. The Vendor should inform in advance about the inspection schedule for putting up formal invitation through Owner. Inspection fees of Bihar Boiler Directorate only will be paid by BHEL / OWNER in this regard. **All other incidental expenditures** need to be **borne/absorbed** by the vendor within his quoted price.
2.73	Temporary blanking of ducts / equipment for commissioning, if required, has to be done by contractor free of cost. Main Steam Line & Hot Reheat line Strainers bodies, CRH NRV are erected first by other agency and the lines will be erected by the contractor. All the connecting joints are to be welded by the Contractor adopting special precautions. After Hydraulic Test, the strainer elements are to be fixed. During trial operation, if required, the strainers are to be removed for inspection of debris & cleaning. During all these operation piping contractor shall extend all assistance by providing necessary manpower, T&P and required materials.
2.74	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.
2.75	Welding of Duct with at terminal point of chimney is to be done by the contractor within the quoted rate.
2.76	Instrument tapping coming on the Ducts to be welded/fitted on the Duct to be done by the contractor within the quoted price.
2.77	Erection of total trim piping system coming under various Product groups - 21, 24, 42 & 80. Erection will cover total Welding Radiography, NDT and fixing of hangers and support.
2.78	For site routed piping based on schematic drgs, no layout drgs. will be provided. Contractor to deploy specially skilled manpower for these type of piping for drawing optimum advantage in laying with minimum joint and maximum flexibility. On completion of such piping, contractor should submit the 'AS-BUILT' drgs. For record purpose.
2.79	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.
2.80	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.
2.81	The following works shall also be in the scope of this contract :
2.82	Cutting of suspension for piping etc., to suitable sizes and adjustment as required.
2.83	Matching of expansion / walls / places/ pieces, their assembly bolting and welding.
2.84	Pre-assembly of spring suspension / hangers and shock absorber for the required load of piping etc.
2.85	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.

2.86	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.
2.87	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.
2.88	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.
2.89	In pipelines like CRH lines, extraction lines, etc., the NRVs will be erected by other erection agency. 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.
2.90	All temporary lines required for Chemical Cleaning of Pre-Boiler system, Condensate piping, 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.
2.91	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.
2.92	Total Fuel oil system piping is included in the contract scope and this will cover entire piping from existing fuel oil pump house to burners of boiler. A separate and complete pressurizing unit, with all piping up to the new boiler, shall be supplied to cater for the proposed plant. The function of the fuel oil handling equipment is to provide a continuous supply to the ignition and support firing oil burners, at the desired flow rate, temperature and pressure. The Fuel Oil suction lines from the storage tanks shall be equipped with the following items:
2.92.1	• Means for isolating the fuel oil lines.
2.92.2	• Fuel oil suction strainers.
2.92.3	• Fire valves (for quick isolation of the system in case of a fire).
2.93	Required trestles, if any, for supporting / laying the pipe lines are not in scope of the bidder.
2.94	All temporary piping required for chemical cleaning and Steam blowing operation of the Unit including pre-boiler system have to be carried out by the vendor under the scope of this specification. While the erected tonnage of the temporary piping will be **paid as per Rate applicable for Non-Pressure Parts,** all other allied works incidental to conductance of chemical cleaning & Steam blowing operation need to be carried out by the vendor within his quoted rate.
2.95	**The** tank **required for pouring and mixing the chemicals need to be dismantled/shifted by the vendor along with its supporting structures from its existing location within his quoted rate**. The approx. Tank size will be about 3m x 3m x 2m. The contractor shall carry out required rectification/patch-work as required and the plate for such work will be supplied free of charges. Similarly the Steel required for supporting the tank will be supplied free of charges. **Vendor to take special note of the fact that no charges towards handling, supporting / dismantling and return of the tank will be paid by BHEL and the same need to be executed within the quoted rate** of the vendor. The vendor is also expected to dismantle the facility and return the material to BHEL stock-yard.

2.96	On completion of the specified commissioning activities vendor shall have to dismantle all the temporary piping and other facilities (established for carrying out the operation) within his quoted rate.
2.97	Chemical circulating pumps, motors. Starter etc. will be supplied by BHEL. All these are required to be installed after due servicing within the quoted rate of the vendor.
2.98	The gadgets like apron, gum-boot, hand-gloves, face-mask etc. required for handling chemicals by the workmen need to be provided by the vendor within his quoted rate.
2.99	While carrying out the sheeting work at Boiler roof and Burner operating floor special safety precautions need to be adopted. Required sheets and fixing hardwares would be supplied under regular supply. The minor hardwares like Bitumen washers, Putty etc. are required to be supplied by the vendor within his quoted rate.
2.100	Instrument tapping coming on the ESP to be welded/fitted by the contractor within the quoted price.
2.101	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.
2.102	Layer of insulation mattress on roof top of ESP (inner roof) shall be applied before outer roof is placed.
2.103	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.
2.104	All the collecting and emitting 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.
2.105	Erection of electrical equipment like high voltage rectifier transformer, VFDs, heating elements, rapping gear motor etc. are included in the scope of the contractor. Filtration of the Transformer oil also , if required, need to be done by the vendor within his quoted rate and for carrying out the same , vendor must deploy one 500 LPM oil filtration unit**.** However, erection of panels, Laying of cables, cable trays, termination of cables, glanding of control panels etc. are excluded from the scope of the vendor.
2.106	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.
2.107	For all plate welding , seal welding from inside and stich welding from other side is to be followed as per drawing.
2.108	Roof top sheeting & side cladding over ESP pent house to be done by the vendor 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 vendor within his quoted price.
2.109	Minor straightening of plates of inner / outer roof, funnels, GD screen sheets, hopper panels damaged during transportation shall be carried out by the vendor within his quoted rate.
2.110	Boiler, Piping, ESP materials etc. as relating to this scope of work which are lying at various storage locations inside plant premises may require to be straightened/ serviced/ repaired for minor damages/ made rust-free etc. which would be required due to prolonged storage or re-handling of items. Bidders are requested to assess the volume of such activities prior to quoting their rates since all such activities to be done within the quoted rates by the vendor.
3.0	**HYDRAULIC AND OTHER TESTS**

3.1	The contractor shall carry out the required tests up to the battery limit on the boiler and the pipelines such as hydrostatic test of the main boiler, gas tightness test for ducts by appropriate methods, furnace pressure tightness test etc. It may be required to do the gas tightness test of ducting and boiler furnace by filling up air and pressurizing with the help of compressor / Fan. The installation of Fans/Compressors (if required) shall e within the scope of the bidder without any extra cost to BHEL. All the above tests shall be repeated till the successful completion of tests is certified by BHEL as a part of the work.
3.2	Contractor shall lay all necessary temporary piping with valves, pressure gauges; blank plate's 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.
4.0	**PRE-COMMISSIONING TESTS AND COMMISSIONING**
4.1	Commissioning of the boilers will involve Pre-commissioning checks, test running of individual equipment or system, trial runs of all the equipment erected, lighting up of the boiler for refractory drying, alkali boil-out of boilers, acid/chemical cleaning, floating of safety valves, flushing of all the lines by air, acid/chemical, oil or steam as required and any other works incidental to pre- commissioning & commissioning. Contractor shall supply adequate supervisory manpower, labour, tools and consumables except those to be provided by BHEL as per this specification for all these activities without any extra cost
4.2	Chemical cleaning will involve cutting of some of the existing valves or removal of caps of some stubs, 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. Boroscopic inspection have to be carried out before/ after steam blowing as per BHEL standard procedure. Cutting of hand-hole plugs, refixing of same, NDT and all related activity is within your scope of work. Testing Instruments for performing the tests will be provided by BHEL.
4.3	Re-welding of the hand-hole plugs or stubs 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.
4.4	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 Engineers instruction. If any part of the boiler needs repair, rectification and replacement due to poor workmanship of the vendor, the same shall be done by the contractor at his cost. The parts to be replaced shall be provided by BHEL.
4.5	Commissioning of ESP shall involve carrying out of all required tests on ESP & its auxiliaries such as air leak test, gas distribution test, motor no load test, rapping mechanism trial runs, ESP interlock tests, centrifuging of transformer oil, charging of transformer fields, commissioning of all electrical equipment / panels, heaters and their proper tuning etc. as per instruction of BHEL Engineer. The contractor shall provide all consumables, labour, scaffoldings and any other items required for satisfactory testing.
4.6	Commissioning of the boiler will involve trial run of all the equipment erected, lighting up for refractory drying, alkali boil out, acid cleaning, passivation, preservation, steam blowing and floating of safety valves, flushing of all the lines by air, oil or steam as the case may be, trial run of the boiler, servicing of valves and any other works incidental to commissioning. Contractor shall supply manpower round the clock, consumables (other than which are to be provided by BHEL free of charges) and T&P for all these works shall from part of work.
4.7	Contractor has to provide all categories of labours including necessary tools, consumables and supervision during the period of commissioning of boiler till

	handing over.
4.8	Cleaning and servicing of all the filters / strainers, toppings of oils coming in the system / equipment shall be done by the contractor within the accepted price. This activity will start from pre-commissioning check of equipment / system and will continue till the equipment or system is handed over to customer.
4.9	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.
4.10	During commissioning, opening of valves, changing of gaskets, 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.
4.11	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 extra. For this purpose, daily labour report indicating therein, nature of work carried out, consumables used etc, shall be maintained by the contractor and get the same signed by BHEL Engineers every day.
4.12	**Performance of guarantee test**: The final performance and guarantee tests of the unit 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. The man-power deployed for this purpose shall be made as per rate schedule.
4.13	Contractor to provide necessary commissioning assistance from pre-commissioning stage onwards and up to continuous operation of the unit & handing over to customer. The category of personnel to be strictly as per site requirement and to be in consonance with the various pre-commissioning and commissioning programs made to achieve the schedule agreed with customer. It may be noted by the bidder that they will have to provide sufficiently experienced engineer/supervisor in adequate numbers so that the equipment / system can be commissioned with just overall supervision from BHEL.
4.14	DELETED
4.15	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.
4.16	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.
4.17	The contractor has to provide required supervisory and skilled man power assistance during pre-commissioning and commissioning checks of motor operated valves, actuators, control valves etc without any extra charges.
4.18	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.
4.18.1	Pipe Fitters / General Fitters / Millwright Fitters - 2 nos.
4.18.2	Rigger / unskilled workers - 5 Nos.
4.18.3	Electricians - 2 Nos.
4.18.4	Supervisor - 1 No.
4.18.5	Valve Technician - 1 No.
4.18.6	HP Welder - 1 No.
4.19	The above figures show 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.
4.20	It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL Commissioning Engineers involving considerable payment of overtime.
4.21	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.
5.0	**WELDING, HEAT TREATMENT & RADIOGRAPHY**
5.1	The pressure parts shall be erected in conformity with the provisions of Indian Boiler Regulations and as may be directed, as per other standard/specification in practice in BHEL. The method of welding Viz. ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions. All the prepared/matched edges will have to be suitably protected to prevent rusting or foreign material ingression.
5.2	Welding of high tensile structural steel and pressure parts shall be done by using certified welders, who posses requisite certificate and who are approved BHEL Engineer.
5.3	All welders shall be tested and approved by BHEL Engineer before they are actually engaged on the work even though they may possess 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. The contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by BHEL/statutory requirements.
5.4	BHEL Engineer is entitled to stop any contractor's welders from his work if his work is unsatisfactory for any technical reason or there is a high percentage of rejection of joints welded by him, which, 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. Monthly performance reports of welders, as per BHEL welding manual, have to be submitted to BHEL/BRBCL as per the format to be provided by BHEL.
5.5	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. Adequate pipe material and the welding filler as provided in the document will be arranged by BHEL and all testing facility shall be made available by contractor. If any additional pipe/welding filler is required, the same have to be arranged by contractor at his cost.
5.6	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 Bihar Boiler Directorate. Contractor has to arrange for such regular evaluation of radiographs without accumulation of any backlog. Evaluation fees as applicable will be reimbursed by BHEL / Customer in this regard on production of due documentary evidences.
5.7	Preheating, post-heating and stress relieving after welding are part of erection work and shall be performed by the contractor in accordance with the instructions of

	BHEL Engineer. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the contractor shall have to arrange for the labour, all heating elements, thermocouples, compensating cables, insulation materials like mineral wool, asbestos cloth, ceramic beads, asbestos rope, etc., required for the heat treatment and stress relieving works. During preheat/stress relieving operations, the temperature shall be measured at one or more 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, 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 Bihar Boiler Directorate approved agency before use and validity renewed at appropriate intervals, Required fees to be paid for initial and periodic calibrations should be borne by the contractor.	
5.8	All low hydrogen electrodes shall be baked and dried up to 350 deg C for an hour in an electric electrode drying oven and to be kept at 150 deg C before they are used in erection work, and all welders including high pressure welders shall have a portable electrode drying oven at the work spot.	
5.9	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 Vendor within his quoted price.	
5.10	The technical particulars, specifications and other general details of work shall be in accordance with AWS 0.1.1.72 clause 6.11. or ASME Section IV, V & IX and IBR or ISO as specified by BHEL.	
5.11	Contractor shall note that 100 % radiography shall be done at the initial stages on all the high pressure welding joints. Subsequently, on the basis of quality of welding, radiographic inspection shall be done on the following basis.	
	Welded tube/pipe	**Minimum % of weld to be rediographed**
5.11.1	Pipe & tube having bore up to 178 mm	10 %
5.11.2	Pipe & tube having bore of 178 mm and above.	100 %
5.12	The percentage given above are tentative, which may be increased depending upon the quality of joints at the discretion of BHEL.	
5.13	Low speed high contrast fine grain films (D-7 or equivalent) in 10 cm width only should be used for weld joint radiography. Film density shall be between 1.5 to 2.0.	
5.14	All radiographs shall be free from mechanical, chemical or process marks to the extent they shall not confuse the radiographic image. Radiography should be taken only after removal of cleats etc. by grinding from tubes wall for getting better image.	
5.15	Penetrameter as per ASME/ISO, shall be used for all exposures.	
5.16	Lead numbers and letters (generally of 6 mm size) are to be used for identification of radiographs. Contract no, joint identification, source used, welders identification, SFD used are to be noted down in the paper cover of radiography. Load intensifying screens for front & back of the film shall be used as per the instructions of BHEL Engineer.	
5.17	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 exposure on pipes, on Overlap of about 25 mm of film shall be provided.	
5.18	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. Necessary storage pit also to be prepared by the vendor for storing the radio-active isotopes in compliance with the norm decided by BARC. Contractor's radiographers shall also be registered with BARC for film badge service. Contractor shall provide all skilled and unskilled workmen required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work. 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 requirements 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 possessing current valid certificate from CIB / BIHAR in their rolls and also to be deployed in this project.
5.19	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. Out of the shots taken for radiography, BHEL may take check shot of radiography (in general 1%). Vendor has to carry out the same within quoted rate.
5.20	All the radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL.
	For erection & welding of SA335 P91 material please refer the “PROCEDURE FOR ERECTION & WELDING OF SA335 P91 MATERIALS” given in this specification.
	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.
5.21	The defects as pointed out by BHEL engineer/inspecting shall be rectified immediately to the satisfaction of Engineer and re-radiographed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.
5.22	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.
5.23	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 statutory evaluation charges in respect of such repeated evaluation shall have to be borne by the contractor**.**
5.24	The contractor shall also be equipped for carrying out other NDT, like liquid penetrant inspection, magnetic particle inspection, etc as & when required for work within the quoted rates.
5.25	Contractor has to make his own arrangements for air-conditioned dark room to process the radiographs.
5.26	For carrying out ultrasonic testing of welded joints large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.
5.27	It may also become necessary to adopt inter layer radiography/ MPT/UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The contractor shall take all this into account and quote the price inclusive of all such work and radiography.
5.28	The welded surface irrespective of place of welding shall be cleaned of slag and painted with primer paint to prevent corrosion at no extra cost towards this. Paint for this purpose shall be provided by contractor.

5.29	It is obligatory on the part of the contractor to give daily feedback on progress of completed HP joints, joints stress relieved etc.
5.30	The contractor shall carry out the edge preparation of weld and joints at site in accordance with the details acceptable to BHEL Engineer. Machining or automatic flame cutting shall be used only where edge preparation otherwise it's impractical. All slags shall be removed from cuts and all hand cuts shall be ground smooth to the satisfaction of BHEL Engineer.
6.0	**DRUM LIFTING & MISCELLANEOUS POINTS**
6.1	Boiler drum has been already erected in position
6.2	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 (with required capacity) shall also be provided by contractor.
6.3	Assistance for calibrating/ testing the power cylinders, valves gauges, instruments etc, and setting of actuators coming under various group shall be provided by contractor within quoted rates.
6.4	Headers are provided with hand holes for cleaning. The holes are closed with hand hole plates by seal welding prior to boiler operation. The periodical removal and re-welding of the hand hole plate will have to be done as part of the contract.
6.5	Skin casing sheet for covering the boiler roof panels, rear arch tubes and other areas will be supplied as per BHEL standard of practice. Any cutting and fabrication to suit the site conditions shall be carried out within the quoted rates.
6.6	It is the responsibility of the contractor to engage his workmen in shifts or on overtime basis for achieving the desired progress and target set by BHEL. The contractor's quoted rate shall include all those contingencies.
6.7	The contractor is strictly prohibited from using any of the boiler components like angles, channels, hand-rails for any temporary supporting or scaffolding work or for making pre-assembly bay. In case of such misuse, a sum as determined by BHEL shall be recovered from contractor's bills. Also the contractor will be responsible for the safe custody and proper accounting of all materials issued in connection with the work. If the contractor has drawn materials in excess of the work/design requirements, recoveries will be affected for such excess drawls at the rates prescribed by manufacturing units.
7.0	**LINING AND INSULATION WORKS**
7.1	Application of various types of Refractory and insulation materials, welding/fixing iron components to support insulation materials, outer sheet casing etc are included in the scope of this specification.
7.2	Refractory materials include castables standard and shaped firebricks, refractory mortar, cement plaster etc. The work of chipping and cutting of firebricks to suit the site conditions is the responsibility of the contractor.
7.3	Insulation materials include insulation bricks, slabs, their mortar, insulation wools, readymade wool mattresses, asbestos materials like mouldable insulations, their mortars, mouldable insulation in powdered form. Cutting and shaping of insulation materials to suit site conditions is contractor's responsibility.
7.4	Steel components include all reinforcing steel components for refractory and insulation like small hooks, long hooks, studs, supporting plates, sheets, angles, wire mesh, expanded metal, threaded steel items, lugs, binding wires, rods etc cutting bending, welding, riveting, screwing etc to suit the site conditions wherever necessary for the purpose of application of insulation and refractory materials shall be carried out by the contractor as part of the scope of work.
7.5	Providing necessary shuttering and centering for refractory and insulation works, curing the castable refractory etc shall form part of this work.
7.6	Wool insulation covers both application of readymade wool mattresses and preparation and application of specified thickness and shaped mattresses like single layer or multi layers out loose wool, with one side or all sides wire-mesh, as may be

	directed by BHEL Engineers. Wool insulation also covers execution of removable type of insulation at expansion joints, valves and other fittings special type insulation for bends, steam tracing, flanges, steam traps etc for controls and instrumentation. These gaps have to be finished as per drawings at a later date. The lined surfaces which may be dismantled at different places for inspection and checking while erection and commissioning of boiler shall also be done by contractor at his own cost.
7.7	Certain gaps and openings are to be left in the Refractory and insulation for fixing gauge glasses and after fittings.
7.8	Sheet metal cladding over insulation is also integral part of the erection work. Only experienced tin smiths shall be engaged for such work. Metal cladding will consists of plain steel sheets, GI sheets, plain/ribbed/corrugated aluminum sheets. The sheets will be supplied in standard lengths and width. Cutting them to required sizes, fabricating bends, boxes etc. for proper covering shall be done by the contractor under this specification.
7.9	All the machines, equipment, tools and tackles required for sheet metal work, preparation and application of refractory materials shall be provided by the contractor within the quoted rates.
7.9.1	Scaffolding pipes shall be used for usage in boiler and ducting areas to avoid fire hazards. The necessary scaffolding pipes shall be arranged by the contractor at his cost.
7.10	Painting of the inside surface of sheet metal cladding with two coats of anticorrosive black bituminus paint shall be carried out by the contractor. Paints required for the above shall be supplied by the contractor within quoted rate.
7.11	If during erection & commissioning of boiler, any of the boiler parts to be temporarily fixed and then replaced by permanent ones at a later date or if some parts are to be opened for inspection, the same may necessitate removal & re-application of refractory, insulation, which shall be done by the contractor and the rate quoted shall be inclusive of all such contingencies.
7.12	The damages, wastage and loss to the individual items of refractory, insulation materials shall not exceed 5 % of the design quantities of individual items.
7.13	All the metal surfaces where castable / pourable refractory are to be laid, two layers of **black bituminous paints** are required to be applied before applying of refractory within the quoted rate. Paints required for the above shall be supplied by the contractor within the quoted rates.
8.0	**FINISH PAINTING**
8.1	All exposed metal parts of the equipment, structure, auxiliaries, piping, and other items (covered within the scope of this contract) after installations are to be painted. The surfaces are to be thoroughly cleaned of all dirt, rust, scales, grease, oils and other foreign materials by wire brushing, scrapping, any other method as per requirement of BHEL. The same will be inspected and approved by the engineer before painting.
8.2	Mostly the equipment / items/ components will be supplied with one coat of primer paint and one coat of finish paint. However, during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour. Besides above two coats of approved primer paint is to be applied on all the bare / unpainted surfaces. The gas cut stubs would require being ground and rounded.
8.3	After applying the primer paints, wherever required, all structure / equipment / items, shall be finish **painted with Alkyd / alloyed resin machinery enamel paints / Synthetic enamel** as specified by BHEL engineer. The number of coats / paint thickness shall be as indicted in the drawing / documents. However at least two coats of finish painting is to be applied. In case proper finish is not obtained in two coats, the contractor shall apply additional coat (s) till proper finish / paint thickness is achieved. Certain equipment / Items are required to be painted with approved quality heat resistant paint. After completion of painting all bright spots shall be cleaned to

	the satisfaction of Engineer.
8.4	Certain equipment like control panels, valves etc. shall require spray painting. The contractor shall make arrangements of the required equipment for spray painting at his own cost. Spray painting at the job site shall be permitted only at times and locations approved by Engineer.
8.5	Contractor at no extra cost to BHEL shall apply all paints, primers; arrange tools and other consumables including scaffolding materials required for finish painting. **Required Paint and Primer need to be supplied by Vendor within his quoted rate.** The paint need to be sourced from reputed BHEL vendor and quality of the paint shall be checked by BHEL prior to application. In the event of failure in supply of the paint by the vendor of proper quality and quantity as per requirement, BHEL shall supply the paint and recover the cost with due BHEL overhead from the very next payable bills of the Vendor.
8.6	The contractor may be required to fill up dents / marks by applying putty before final painting of equipment. All materials and arrangements have to be made within quoted price / rates.
8.7	The contractor shall provide legends with direction of flow on equipment and piping in size specified by Engineer. Letter writing shall be done in Hindi / English or in both languages.
8.8	The painters have to under go test and only qualified painters will be allowed to work.
9.0	**SCOPE – Equipment / System descriptions**
	The scope of work of the contractor for each package of Boiler and auxiliaries will be inclusive but not limited to following:
9.1	Boiler Steam Drum with internals and fittings.
9.2	Complete water cooled furnace wall system 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.
9.3	Complete circulating system including down comers, headers, riser tubes etc.
9.4	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.
9.5	Complete Re-heater system including headers, connecting pipes, coils drains, drain funnels, drain pipes up to Blow down tank, safely valves etc.
9.6	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.
9.7	Economiser system including connecting pipes,headers & economiser re-circulation system.
9.8	Rotary Air heater
9.9	Steam Coil air pre-heater (SCAPH) with accessories.
9.10	All Boiler integral piping valves & fittings, including check valves, motorised isolating valves, motorised stop valves, motorised startup valves, blow-down valves, safety valves, and electromatic safety valves, for drum, super-heater and re-heater, safety valve escape piping 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.
9.11	All approaches to valves and mountings including platforms.
9.12	Boiler refractory and application of insulating materials along with required fixing material for the equipment.
9.13	Boiler inner casing wherever necessary.
9.14	Boiler outer sheet steel casing (MS) Aluminium sheet casing/ Insulation jacket for equipment including hot air/Flue ducts etc.
9.15	Air & Gas duct work with necessary expansion joints with protection against ash erosion insulation wherever required, dampers gates, supports, access doors etc. and support steel work.
9.16	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.
9.17	Boiler roof mountings including access / inspection doors for boiler / furnace, air-heater, economiser, and ducts etc and also access for power operated maintenance platform.
9.18	Complete soot blower and wall blower system with drains, entire piping and fittings including control valves.
9.19	All drain lines including trap discharge outlet with drain funnels/drain receivers and pipelines from funnels discharge up to the nearest plant drainage system.
9.20	Temperature measuring probe for start up (at furnace outlet) along with its starter cum control panel.
9.21	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.
9.22	Erection of Elevator structure including it's bracings, connecting members and cladding.
9.23	Erection of LDO, pumps, motors, heaters etc. along with applicable piping.
9.24	Erection of burner block, guns, ignitor, ignitor fans etc.
9.25	Erection of scanner air fan with motor and its ducting upto burners.
9.26	Structural steel material & purlin for boiler roof, drum level and burner operating floor.
9.27	Boiler roof sheeting and weather protection sheeting at Burner platform.
9.28	Complete buck stays and tie bars for pressure part system.
9.29	Complete erection of Pulverized fuel piping including supports from Mill Outlet Valves to Burner Block.
9.30	Erection of total Fuel Oil line covering suction lines from the storage tanks to Fuel oil pump house and discharge line from Pump house to Burner floor is included in the scope of this tender.
9.31	Erection of total Electro-static Precipitator. However, erection of Electrical System , other than rectifier transformers, is excluded from the erection scope of the vendor.
9.32	Erection of all radial and axial fans covering F.D, I.D, P.A. and Seal Air fans.
9.33	Erection of Pulveriser and motors with their handling devices, monorails etc.
9.34	Erection of Raw coal Feeders, Row coal bunker outlet gates and raw coal piping of stainless steel, from banker to feeders with one number MD gate at each bunker outlet and one number mutually operation get at feeder inlet. Stainless steel piping from feeder to mill with couplings supports etc.
9.35	All pipe-work shall be designed, manufactured and erected conforming to the regulations and recommendations of the Indian Boiler Regulations and an Internationally recognized standard such as ANSI B31.1. and materials are selected accordingly. Pipe-work shall be subject to the Independent Inspection Authority and Engineer for approval prior to Erection.
9.36	**Main steam system** from boiler super heater header to Turbine including ESV, equalising line and branchings for Aux. PRDS, HP By-Pass etc.
9.37	**Hot re-heat system** from HRH Header at Boiler end to I.P Turbine including I.V , LP Bypass Piping up to L.P. Bypass Valve.
9.37.1	**Total feed discharge system** piping including H.P heater by-pass, Group protection Valve and Boiler feed re-circulation up to Deaerator.
9.37.2	**Cold re-heat system** from Turbine end to CRH at Boiler end including CRH NRV, re-heat De-super-heater, connection to Deaerator and HP bypass.
9.37.3	**Total auxiliary steam system** piping including Header / inter-connection / supply to various equipment like SCAPH, AH Soot blower, Fuel oil atomisation, Steam

	Ejectors, Gland seals, Steam to F.O. Pump house, Aux. steam to Deaerator, F.O. tracing and other miscellaneous users.
9.37.4	**Extraction Steam Piping** to Deaerator, H.P Heater-1 & H.P Heater-2.
9.37.5	**Spray Water Piping** to HP Bypass, Aux. PRDS, Boiler SH DESH & RH DESH.
9.37.6	Boiler Filling Line.
9.37.7	Total Fire water, Wash water and Cooling water piping related to Boiler & its Auxiliaries.
9.37.8	Total compressed air system including service and instrument air related to Boiler & its Auxiliaries.
9.37.9	Erection of total chemical dosing system including installation of Pumps, motors, tanks and related piping works.
9.37.10	Oil system piping including oil suction piping from F.O. Storage Tank to F.O. Pump House.
9.37.11	Erection of **various tanks, vessels**, drains and vents
9.37.12	Erection of **HPBP oil system** covering valves, Oil unit and it's Piping.
9.37.13	Erection of all temporary piping required for chemical cleaning & steam blowing operation.
9.37.14	Main Steam Strainers, Hot re-heat strainers and CRH NRVs will be erected by TG erection vendor. However welding of these items to be carried by the Vendor within his quoted price.
9.37.15	Dismantling and restoration of valves , Strainers during the pre-commissioning / commissioning stage to be done by the contractor within his quoted rate
9.38	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 reqd. lengths shall be done at site by the contractor within his quoted rate.
9.39	Welding, radiography, heat treatment of piping joints will be as per specification enumerated in the relevant clause.
9.40	Application of Finish Paint on all erected components covered under the scope.
9.41	Note to the bidder: The main boiler support structures and major components of boiler pressure parts has been already erected and the boiler has almost been made ready for drainable hydraulic test. The bidder shall visit the site and get himself apprised about the status of the work already done and the balance works to be carried out by them for making the boiler & auxiliary complete in all respect for operation of the unit. All balance works of the erected system/components including rectification (if any),scrap cutting, painting etc. Is included in the scope of this tender and this shall be carried out by the contractor within his quoted price. The balance works of alignment, welding, NDT etc. of the erected components shall be carried out by the bidder and payment shall be made as per the terms of payment for the works done as per measurement.
10.0	**EXCLUSIONS**
	The following main items are specifically excluded from the subcontractor's scope:
10.1	Boiler civil Foundations.
10.2	Mill bay structures, bunkers.
10.3	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.
10.4	Erection of Cable trays, Cablings, Panels of ESP.

10.5	All concrete floors in boiler area (including concrete roofs at firing and feeder floors etc).
10.6	Erection of the boiler drum.
11.0	**DEVIATIONS**
	The bidder is required to submit with his offer in the relevant schedule/format list of any deviation taken by him without any ambiguity. Any assumptions, presumptions, deviations etc indicated or implied anywhere by the bidder; excepting 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 reserves the right not to recognize any/all deviations submitted after opening of the bid.
12.0	**SERVICES TO BE RENDERED BY THE BIDDER**
	Services for construction, fabrication, equipment erection testing as well as trial run & commissioning of various equipment and accessories under the contract shall include but not be limited to the following:
12.1	Issuing materials from store/open yard from time to time for erection as per the construction program. 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 any successful trial run & commissioning.
12.2	Transport of material to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
12.2.1	Approach road conditions from the stores / yards to the erection site and within erection site may not be ideal for smooth transportation of the equipment and may requires compaction. Contractor may have to be adequately prepared/ required to make necessary arrangement to transport the materials under the above circumstances without any extra cost to BHEL.
12.3	Trial run and commissioning of individual equipment / sub-systems to the satisfaction of Owner / BHEL.
12.4	Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to the rendered under this specification.
12.5	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.
12.6	Supply of all consumables, eg welding electrodes, cleaning agents, diesel oil, lubricant etc as well as materials required for temporary supports, scaffolding etc as necessary for such erection work, unless specified other wise.
12.7	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.
12.8	Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with BHEL, Submission of monthly progress reports and any such document as and when desired by BHEL/owner, including **taking approval of all statutory authorities i.e Boiler Inspector, Factory Inspector, Inspector of Explosives etc** , as applicable for respective portions of work fall under the jurisdiction of such statutes of laws.
12.9	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.
13.0	**GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)**
13.1	Except where otherwise specified, the plant/equipment shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as mentioned elsewhere in contract specifications, 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.
13.2	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.
13.3	In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements which are more stringent shall govern.
13.4	Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.
14.0	**PROTECTION**
14.1	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.
14.2	Electrical equipment, 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.
14.3	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.
14.4	All erected equipment / components to be preserved as per the preservation recommendation of BHEL. For this type of presentation, contractor shall engage an exclusive team of 5 persons for meeting the continuous requirement. However, the required preservatives will be supplied to the contractor free of cost. All other consumables including wire brush, emery papers, painting brush etc to be supplied by the contractor within the quoted rate.
15.0	**ERECTION SCHEDULE**
15.1	In order to achieve the overall completion schedule, the contractor shall provide BHEL all information covering erection sequence, testing and commissioning activities. These schedules may be based on the recommended erection procedures and will be subject to discussions/agreements with the owner/ BHEL subsequent to the award of contract.
15.2	The successful bidder shall have to provide all the above schedules in a tabular form in addition to that in the form of network and these shall necessarily include information not limited to the earliest and latest dates for various activities/submissions and also any related constraints.
16.0	**CONTRACT MANAGEMENT**
	The Contractor should also submit Network program for the erection and commissioning of various items. These networks shall show the Owner / BHEL hold points(CHP) which have to be cleared by Owner/BHEL or their authorised representative(s) before further erection/commissioning can take place. These program for the erection and commissioning would clearly identify responsibilities of the Contractor and Owner/ BHEL. Networks shall be submitted within 4 weeks of the date of finalisation of award of work / placement of LOI for approval of BHEL.
17.0	**CONSTRUCTION MANAGEMENT**
17.1	Based on the PERT Network program, within one (1) month of the award of the Contract, the Contractor shall submit a program of construction / erection / commissioning, for the implementation. These program would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring, The three monthly rolling program with the first month's

	program being tentative based on the site conditions would be prepared based on these program . The Contractor shall also be involved along with the Owner/BHEL to tie up detailed resource mobilisation plan over the period of time of the contract matching with the performance targets.
17.2	The program would be jointly finalised by the site in-charge of the contractor with BHEL/owner's project coordinator as well as the site planning representative. The erection program with also identify the sequential erectable tonnages.
18.0	**PROJECT PROGRESS REVIEW MEETINGS**
18.1	Periodic progress reviews on the entire activities of execution in respect of supply & 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. Actions will be placed on the concerned agencies and decisions will be taken to expedite/ speed up the progress. Minutes of such meetings will be issued reflecting the major discussions and decisions taken and circulated to all concerned for reference and action. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
18.2	In addition to the above and to streamline the construction and erection at site a suitable frequency and forum of periodic meetings between the contractor and the Owner/BHEL will be decided upon as part of erection coordination procedure.
19.0	**SITE ORGANISATION**
19.1	The contractor shall maintain a site organisation of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organisation shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organisation shall be headed by a competent construction manager having sufficient authority to take decisions at site.
19.2	On award of contract, the contractor shall submit to BHEL site organisation chart indicating the various levels of experts to be deployed on the job. BHEL reserves the right to reject or approve the list of personnel proposed by the Contractor. The persons, whose bio-data have been approved by BHEL, will have to be posted at site and deviations in this regard will not generally be permitted.
19.3	The Contractor should also submit to BHEL for approval a list of construction equipment, erection tools, tackle etc. prior to commencement of site activities. These tools & tackles shall not be removed from site without written permission of BHEL.
19.4	The organisation chart for site should indicate the various levels of experts to be posted for supervision in the various fields in erection, commissioning etc as applicable. For proper supervision of the work, the vendor shall ensure providing one qualified supervisor against deployment of 15 workmen.
20.0	**GENERAL GUIDELINES FOR FIELD ACTIVITIES**
20.1	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.
20.2	The contractor shall co-operate with the Owner/BHEL and other Contractors working in site and arrange to perform his work in a manner so as to minimize interference with other contractors works. BHEL's engineer shall be notified promptly of any defect in other contractors works that could affect the contractors work. If rescheduling of contractors 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.
20.3	The Engineer shall hold weekly/Daily 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.
20.4	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.
20.5	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.
20.6	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 the Owner / BHEL.
20.7	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.
20.8	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.
20.9	All the works such as cleaning, checking, leveling, 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, stainless steel 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.
20.10	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.
20.11	Equipment and material which wrongly installed shall be removed and reinstalled to comply with the design requirement at the contractor expense, to the satisfaction of BHEL/Owner/Consultant.
20.12	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 T&P/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 MM engineer.
21.0	**ERECTION SERVICES**
21.1	As part of the 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 contract 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.

21.2	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 unfavorable construction conditions. No field activities shall be performed by the contractor under conditions which might adversely effect 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 unfavorable construction conditions in no way relieve the contractor of his responsibility to perform the works as per the schedule.
21.3	The contractor shall supply all the skilled workmen H.P. welders, gas cutters, electricians, riggers, sarangs, erectors, carpenters, fitters, masons, laggers, tin-smiths, instrument machines etc, in addition to other skilled, semi-skilled and unskilled workmen required for all the works of handling and transportation from site store to erection site, erection, testing and commissioning contemplated under this specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserves 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.
21.4	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/consultant.
21.5	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.
21.6	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 personal, and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
21.7	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.
21.8	It is the responsibility of the contractor to engage his workman in shifts or on overtime basis for achieving the target set by BHEL during erection, commissioning and testing period. Contractor's quoted rate shall include all these contingencies.
21.9	For rendering commissioning assistance during running of the unit 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 vendor for his day –to-day work. The gang need to be provided during Day & Night shift also whenever required by BHEL commissioning engineer. They shall be equipped with all necessary hand-tools to attend all the incidental works during commissioning.
21.9.1	In the event of failure of the contractor to provide necessary commissioning assistance indicated above as per requirement for a continuous period of 15 days or more, BHEL reserves the right to recover the amounts at the following rates and organize the services :
21.9.2	@ Rs 18,000/- (Eighteen thousand) /month for Supervisor

21.9.3	@ Rs 12000/- (Twelve thousand) / month for each persons.
22.1	The organisation structure and qualification data of key personnel for the management and implementation of the proposed quality assurance programme.
22.2	System for site erection control including process controls and fabrication and assembly controls.
22.3	Control of non-conforming items and system for corrective actions.
22.4	Inspection and test procedure for all site related works.
22.5	Control of calibration and testing of measuring and testing equipment.
22.6	System for quality audit.
22.7	System for indication and appraisal of inspection status.
22.8	System for maintenance of records.
23.0	**GENERAL REQUIREMENTS - QUALITY ASSURANCE**
23.1	All materials, components and equipment covered under this specification shall be erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme.
23.2	Field Quality plans will detail out for all the equipment, the quality practices and procedures etc to be followed by the contractor site quality control organisation. During various stages of site activities from receipt of materials/ equipment at site.
23.3	Quality audit/approval of the results of tests and inspection will not prejudice the right of BHEL to reject an equipment not giving the desired performance after erection and shall not in no way limit the liabilities and responsibilities of the Contractor in earning satisfactory performance of equipment as per specification.
23.4	Repair/rectification procedures to be adopted to make any job acceptable shall be subject to the approval of BHEL/ Owner.
24.0	**INSPECTION, TESTING AND INSPECTION CERTIFICATES**
24.1	The Engineer, his duly authorised representative and/or an outside inspection agency acting on behalf of the BHEL/Owner shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Engineer and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works. Necessary arrangement for carrying out inspection including supply of labour, IMTEs, area illumination and scaffolding, if required will be contractor's responsibility and same has to be carried out within the quoted price.
24.2	To facilitate advance planning of inspection in addition to giving inspection notice the contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at customer hold point and final inspection stages. Updated quarterly inspection plans will be made for each 3 consecutive months and shall be furnished before beginning of each calender month.
25.0	**QUALITY CONTROL & QUALITY ASSURANCE**
	Contractor's Engineers and supervisors shall be adequately qualified and also inclined to do a quality job. The quality assurance Engineer shall co-ordianate all aspects of quality control, inspection, implemention of quality assurance procedures laid down in Quality Plan and technical specification by BHEL. He shall fillup quality assurance logsheets / formats and submit to BHEL for joint inspection and acceptance.
26.0	**CERTIFICATE TOWARDS COMPLETION**
	The work under the scope of the contractor will be deemed to be completed in all respects only when so certified by BHEL. The decision of BHEL shall be final and binding on the contractor.
27.0	**DEWATERING**
	Contractor shall ensure at all times that his work areas & 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 regards shall be admitted by BHEL. No separate payments for dewatering of subsoil or surface

	water if required at any time during execution of the work including monsoon period shall be considered by BHEL .
28.0	**CONSUMABLE**
28.1	The contractor shall provide within finally accepted price / rates, all consumables like all welding electrodes (including alloy steel and stainless steel), filler wires, all gases (inert, welding, cutting), soldering material, dye penetrants, radiography films. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are also to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding materials hardware items etc required for temporary works such as supports, scaffoldings are to be arranged by him. Sealing compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him.
28.2	All the shims, gaskets and packings, which go finally as part of equipment, shall be supplied by BHEL free of cost to the extent supplied by the manufacturing units. Requirement in excess, shall have to be met by the vendor within his quoted rate.
28.3	It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of consumables. Non-availability of any consumable materials or equivalent suggested by BHEL cannot be considered as reason for not attaining the required progress or for additional claim.
28.4	Only TIG filler wire, as supplied by BHEL's manufacturing units as part of regular supply, shall be supplied by BHEL free of cost. Required quantity as arrived at by calculation / standards will only be supplied. It would be the contractors' responsibility to account for the consumption of these filler wires. Additional requirement beyond standard / calculated quantity will be at cost recovery basis only unless and otherwise accounted for. Surplus quantity of TIG filler wire, if any, shall be properly stored and returned to stores.
28.5	It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of electrodes etc before procurement of welding electrodes. On receipt of electrodes at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number, date of expiry etc and produce test certificate for each lot / batch with correlation of batch / lot number with respective test certificate. No electrode without a valid test certificate will to be used.
28.6	BHEL reserves the right to reject the use of any consumable including electrodes, gases, lubricants / special consumables if it is not found to be of the required standard / make / purity or when shelf life has expired. Contractor shall ensure display of shelf life on consumable wherever required and records maintained.
28.7	In case of improper arrangement for procurement of any consumable, BHEL reserves the right to procure the same from any source and recover the cost from the Contractor's first subsequent bill at market value plus the departmental charges of BHEL from time to time (30% at present). Postponement of such recovery is normally not permitted. The decision of Engineer in this regard shall be final and binding on the Contractor.
28.8	All lubricants and chemicals required for cleaning, pre-commissioning, commissioning, testing, preservation and lubricants for trial runs of the equipment shall be supplied by BHEL / BHEL's client free of cost. All services including labour and T&P will be provided by the contractor for handling, filling, emptying, refilling etc. the consumption of lubricants / chemicals shall be properly accounted for. Surplus material if any shall be properly stacked / packed and returned to stores.
28.9	Transportation of oil drums, from stores, filling of oil and filling of oil for flushing, first filling of oil and subsequent changeover or topping / making up till the unit is fully commissioned and handed over to customer is included in scope of this contract. The contractor shall have to return all the empty drums to BHEL / BHEL's client store at no extra cost. Any loss / damage to above drums shall be to contractor's account.
29.0	**ELECTRODES AND GASES**

29.1	All electrodes required for MS, carbon steel, stainless steel, alloy and other metals required for pressure parts as well as non-pressure parts shall be supplied by the contractor after due approval of BHEL and as per design requirement within this quoted rate. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement regarding suppliers, type of electrodes etc. on receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc.
29.2	Only TIG filler wire, as supplied by BHEL's manufacturing units as part of regular supply, shall be supplied by BHEL free of cost. Required quantity as arrived at by calculation / standards will only be supplied. It would be the contractors' responsibility to account for the consumption of these filler wires. Additional requirement beyond standard / calculated quantity will be at cost recovery basis only unless and otherwise accounted for. Surplus quantity of TIG filler wire, if any, shall be properly stored and returned to stores.
29.3	Supply of filler wires will be restricted to the welding of Boiler Pressure-parts and Critical / power cycle piping only. The utilisation of the supplied filler wires of pressure-parts shall be duly accounted for exercising maximum care and ensuring economical usage for minimum wastage. If during erection, it is found that the consumption of filler wire is more than the actual requirement by improper usage, the cost for the additional quantity so consumed shall be recovered from the contractor.
29.4	Storage of electrodes shall be done in a air-conditioned / controlled humidity form as per requirement, at his own cost by the contractor.
29.5	In case of improper arrangement for procurement of above electrodes, BHEL reserves the right to procure the same from any source and recover the cost from the contractor's first subsequent bill at market value plus the departmental charges of BHEL communicated from time to time. Postponement of such recovery is not permitted.
29.6	BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality improper storage, quality date expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.
29.7	Contractor shall submit weekly / fortnightly / monthly statement /report regarding consumption and the stock available of all types of electrodes for cost analysis & preventive measure.
29.8	All the required gases like oxygen, acetylene, LPG, argon, nitrogen required for work shall be supplied by the contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. The contractor shall submit weekly/fortnightly/monthly statement report regarding consumption of the above gases for cost analysis purposes. Safe keeping of inflammable cylinders, distribution using gas manifolds shall be contractors responsibility. BHEL reserves the right to reject the use of any gas in case required purity is not maintained.
29.9	The contractor shall arrange all packing plates / shims required for erection of all auxiliaries and rotating equipment under the scope of this tender specification other than these supplied by manufacturing units at his own cost.
29.10	Sufficient quantity of test plates and pipes, as considered adequate, for testing contractor's High pressure Welders will be supplied by BHEL. Additional pipes, if required, and all other expenses in conducting the tests shall be borne by the contractor within his quoted rate.
29.11	All temporary piping material necessary for conducting Hydraulic test, will be provided by BHEL. However, servicing, erection and dismantling of the same and depositing at BHEL stores is the responsibility of the Contractor without extra charges.
30.0	**PROJECT MANAGEMENT**
	The successful bidder will have to establish computerised project management

	system and the following are the essence of the system.
30.1	Soft copy of colour photography depicting progress of the work, damage to the machine parts (if any) as directed by BHEL site Engr is to be arranged by the successful bidder.
30.2	Receipt and issue of Boiler components will be managed through totally computerized SOMS (Site Operating Management System) and to facilitate issue of Boiler material and reconciliation of the same at regular periodicity. The bidder will have to install 01(One) nos. PCs (MULTIMEDIA PC WORK STATION (Pentium Duo-Processor, 1GHz OR ABOVE), 80 GB HDD & 1GB RAM, 100 Mbps LAN card, 4 Nos. USB Port, Built-in MODEM, External Speakers, 17" Monitor, DVD-R/CD-RW Drive, Mouse with Mouse Pad, of HCL/COMPAQ/ZENITH OR EQUIVALENT MAKE WITH WINDOW XP (SP-2) O/S AND REQUIRED SOFTWARE LIKE MS OFFICE XP PROFESSIONAL, AUTOCAD2005, PAGEMAKER 7.0, Adobe PDF writer, ETC.) with LASER JET printers, scanner COMPATIBLE FOR A3 SIZE-1No with Power backup at places, as per instruction of BHEL from the beginning of the contract for exclusive use by BHEL. The bidder is also to provide 500 Sheets of A4 Sized Paper and 200 Sheets of A3 Size Paper per month from the time of installation of the printers. The required ink cartridges or Toner cartridges as per requirement is also to be supplied by the bidder. This computer/printer shall remain Contractor's property and shall maintain it to the satisfaction of BHEL and they will be allowed to take out the same after completion of the works under this tender specification. 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 one computer operators for reconciliation, progress review & day-to-day planning, documentation purpose right from start of work. Contractor shall provide **Two service staff** for miscellaneous service for BHEL's use at site for reconciliation, progress review and day-to-day planning, documentation purpose etc right from start of work.
30.3	In the event of failure of the contractor to provide computer/printer/Operator Service staff as per requirement for a continuous period of 15 days or more, BHEL reserves the right to recover the amounts at the following rates and organize the services :
30.3.1	@ Rs 15000 (fifteen thousand)/month for each computer operator.
30.3.2	@ Rs 12000/- (twelve thousand)/month for each computer with printer. @ Rs 12,000/- per month for each service staff.
30.4	The successful bidder has to arrange for printing & binding of the Protocol and / or Report and / or Data, pertaining to the scope of the bidder. Contents, Layout Design, Quality of paper/cover, No. of copies etc of such printing and/or binding will be decided by BHEL.
30.5	The successful bidder shall have provide BHEL with all erection / work schedule and **or progress report,** protocol, test report in floppies (compatible to BHEL software) and also in requisite number of hard copies. The input & output data for all such schedule shall be furnished to BHEL in a manner compatible with BHEL software available at site. A copy of the progress report must be submitted to Project Manager / Calcutta latest by 7th of every month covering the detailed progress achieved in the previous month.
31.0	**GENERAL & CSR ACTIVITIES**
	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 upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
32.0	**COMMUNICATION**
	The key personnel deployed by the contractor shall be equipped with mobile phone, e-mail facility for effective communication during execution of the work.
33.0	**IMTE**
	Contractor shall ensure deployment of reliable and calibrated IMTEs (Inspection

	measuring and testing equipment). The IMTEs shall have test / calibration certificates from authorized / Government approved / accredited agencies traceable to National / International standards. Each IMTE shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control. 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.
34.0	**TEST CERTIFICATE FOR T&P**
	Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, manila ropes, winches and slings etc. History card and maintenance records for major T&Ps will be maintained by the contractor and will be made available to BHEL Engineer for inspection as and when required. Identification for such T&Ps will be done as per BHEL Engineer's advice. All T&Ps, lifting tackles, pulling devices, wire rope and slings to be deployed by the contractor must bear valid/latest test certificates for their suitability, and the documents shall be preserved at site.
35.0	**ISSUE OF T&P**
35.1	In the event of BHEL issued T&P, measuring instruments 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 these equipment for purposes other than the scope of work given in this tender document.
35.2	It is the responsibility of contractor to keep these equipment always in working condition and ensure their safe return in working condition to BHEL's store subject to normal wear & tear.
35.3	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.
36.0	**INSURANCE**
	The contractor shall make available the original insurance cover(s) taken by him, against his T&P, assets and workmen compensation and any other cover as may be pertinent to his works and obligatory in terms of law, to BHEL for necessary verification in regard to their adequacy, before commencement of work. However, irrespective of such verification/ acceptance, the responsibility to maintain adequate insurance coverage at all times during the period of the contract shall be of the contractor alone. Such insurance covers to be taken shall be in the joint names of the owner and the contractor. The contractor shall however be authorized to deal directly with the Insurance company(s) and shall be responsible in regard to maintenance of such insurance covers. Insurance covers to be taken by BHEL/ Customer shall be as stipulated under relevant clause of this specification. However, third party liability shall also be in BHEL/customer's scope.
37.0	**LAND**
37.1	Only limited land can be provided free of cost for construction of temporary office, stores, fabrication area etc. within the project premises.
37.2	Land can not be provided for Labour Colony inside / outside the project premises to the contractor to construct labour colony/hutment. The bidder must visit the plant & surrounding areas to assess the situation so that they can make some arrangement nearby to the project premises in consultation with BRBCL/BHEL
37.3	The contractor will be responsible for handing back all lands, **as handed over to him** for his temporary use, to BHEL as per the instruction of BHEL Engineer.
38.0	**WATER**
38.1	BHEL will provide construction water free of cost at one point within 500 Mtrs. from given work premises.

38.2	BHEL will provide free of cost one Drinking water point nearby to the given work premises.
38.3	Further distribution beyond above mentioned points to be arranged by the contractor at his own cost within the working areas.
38.4	Water will be supplied 2 to 3 times in a day. Contractor will have to arrange for storage of water to meet the day to day requirement. BHEL will however arrange for adequate supply of construction water to meet the requirement of water during major concreting.
38.5	The availability of water at the project is limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.
38.6	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and no compensation for delay in work for such interruption shall be claimed by the contractor.
39.0	**ELECTRICITY**
39.1	BHEL will provide construction power on **Free of charges** at 415 V at single point near work premises within 500 Mtr of 1st row Boiler Column of Unit # 4. Further distribution (including maintenance of the distribution lines) beyond this point to be arranged by the contractor at his own cost. Any other voltage if required shall be arranged by the contractor from power supply as above. Contractor will have to provide necessary calibrated meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at each point of power supply along with calibration certificate from authorized / accredited agency for working out the power consumption at his own cost. In case of re-calibration required for any reason the 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 and Regulation as applicable.
39.2	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply 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.
39.3	The Contractor should ensure that the work in critical areas is not held up in the event of power break-down and for the same he should have suitable standby arrangement at his cost. As a part of the bid, a specific proposal in this regard has to be submitted by the contractor. 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.
39.4	The contractor shall have to make arrangements at their own cost for area illumination that will be required in the working areas for execution of the work.
40.0	**AREA REQUIREMENT**
	The contractor shall furnish the estimated area required for the construction of his office, stores, etc. separately. The same will be reviewed by BHEL and allotted to the extent available/considered necessary, depending upon the area availability. No claim whatsoever can be made by the contractor in case the area allotted to him is less than his proposal.
41.0	**CONSTRUCTION OF TEMPORARY OFFICE ETC**
	The contractor shall arrange at his own cost the construction of his temporary office, stores, etc and also the watch and ward of all the above.
42.0	**TOOLS AND PLANTS**
42.1	The contractor is required to provide all necessary tools and plants, (other than those specified to be provided by BHEL) measuring (calibrated) instruments and handling equipment for timely completion of the total works as per contract. The quoted rate shall be inclusive of such requirements. However the contractor shall submit deployment plan of all T&Ps along with tender bid.
42.2	In the event of any failure of the part of the contractor, 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. Decision of BHEL in this regard will be final and binding on the contractor.
42.3	The T&Ps to be arranged by the contractor shall be in proper working condition.
42.4	The list of T&P indicated in relevant annexure are the minimum expected to be provided by the contractor.
42.5	All other tools and plants required for the work including cranes, electric /hand/ pneumatic winches, tractor-trailors, Air compressors, trucks, welding generators/transformers, jacks, slings, pulley blocks, TIG/ARC welding equipment, heat-treatment equipment, temperature recorders, electrode drying ovens, pipe chamfering machines, hydraulic pipe bending machines etc and small tools and plants like chisels, scrappers, spanners, files, screw drivers, electrical tools kits etc required for timely completion of work shall be arranged by the contractor at his own cost. The contractor shall give a list of such equipment to be deployed by them giving details like nos available with them, nos to be deployed, capacity etc of each item in the format enclosed in the annexure for General information about the contractor and the same shall be binding on the contractor during to execution contract. It may be specifically noted that the above items and those in annexure have been mentioned just to give a broad idea to the contractor about the requirement of T&P for such works. However, all T&P's required for smooth and timely completion of work shall be arranged by the contractor at his own cost and BHEL project manager's decision regarding the requirement of a particular item shall be binding on the contractor. The equipment once deployed at site shall not be removed from site without the written consent of BHEL, Construction Manager.
42.6	Sufficient quantities of Guy ropes shall be arranged by the contractor for erection/alignment of columns.
42.7	All tools & plants deployed by the contractor shall be as per the specification approved by BHEL Engineers.
42.8	All the T&P, lifting tackles including wire ropes, slings, shackles and electrically operated equipment shall be approved by BHEL Engineer before they are actually put on use.
42.9	The list of major T&P required to be deployed in indicated in annexure. The list is minimum and not exhaustive but anything required over and above these to suit the site condition/rate of progress/nature of work shall be arranged by contractor at his own cost.
42.10	For the movement of crane, etc, it may become necessary to lay sleeper bed or any other material for obtaining levelled safe approach, for usage of equipment. It shall be contractor's responsibility to arrange for necessary materials for this.
42.11	All the T&P arranged by contractor including electrical connections wherein required shall be reliable/proven/tested with necessary test certificate.
43.0	**TOOLS & PLANTS TO BE PROVIDED BY BHEL (SHARED MACHINERY)**
43.1	The machineries as prescribed in relevant annexure will be provided to the contractor on free of cost basis on availability. The list is only indicative and BHEL is not committed to provide the same.
43.2	The contractor shall ensure that machinery provided to him is kept in good running condition, all along it's use by contractor and after use is returned to BHEL in good condition. BHEL's decision regarding condition evaluation shall prevail.
43.3	However allotment of the Crane amongst various erection vendors will be decided by BHEL engineer considering its priority and necessity. The maximum working period of the crane will be 14 hours / day with one hour recess in-between. Engagement of the crane beyond this period will be on chargeable basis (the charge will be the actual hiring / extra payment made to the crane agency for this purpose). Since the crane will be arranged on sharing basis, vendor has to inform well in advance the exact schedule of requirement based on which allotment will be done by BHEL on availability.
43.4	BHEL will provide one **80T/75T** crane free of all charges on sharing basis to the bidder. The bidder has to arrange operator & fuel for the portion of the usage by him. Since the crane will be arranged on sharing basis, vendor has to inform well

	in advance the exact schedule of requirement based on which allotment will be done by BHEL on availability. In case this (80T/75T) crane is not available to the contractor during his requirement due to reasons attributable to BHEL, BHEL may provide a lesser capacity crane if found suitable for the intended purpose (and this lesser capacity is available at site) on the same terms and condition. Maintenance assistance (if required) for the crane provided under this clause shall be provided by the vendor. Decision of BHEL's Site-In-Charge in this clause shall be final.
43.5	BHEL shall also provide required Induction Heating Equipment for P-91 piping on free of charge basis. Receipts of these items including all accessories are to be shifted from site store to erection places and installed by the bidder. Power supply cables to these equipment are to be provided by the bidder. Entire erection commissioning, shifting from one place to another and day to day maintenance is the scope of the bidder. The bidder will have to include these charges within the quoted rate.
43.7	All arrangements, including providing & laying of sleeper beds, backfilling of approaches wherever necessary for safe movement of the cranes/ T&P as directed by BHEL shall be the responsibility of the contractor. Sleepers for this purpose shall be provided by the contractor.
43.8	During use of cranes issued by BHEL, the activities like 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 without any extra charge.
43.9	Any damage/breakdown maintenance of the machinery arising out of improper handling by contractor shall be to the account of the contractor. BHEL shall reserve the right of repairing the same to its own satisfaction at contractor's cost. During such outage of the machinery, BHEL shall not be responsible to provide any alternative. The contractor shall arrange for such alternative arrangement at his own cost.
43.10	The contractor shall return BHEL equipment / T & Ps issued to him in good condition as and when desired by BHEL. If the return is delayed, hire charges, as applicable shall be levied by BHEL.
43.11	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.
43.12	In case any machinery (given to contractor) is idle and/or 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.
43.13	In case the total work under scope is split, the tools and plants to be provided by BHEL shall be shared amongst the contractors as per discretion of BHEL.
43.14	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.
43.15	The above T&P shall be available with project manager, BHEL. The T&P shall be shared by all contractor working for BHEL at the site and distribution of these shall be done at the discretion of project manager, BHEL on the requirement/priority of the job and the availability of these items.
43.16	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 project 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.
43.18	The above are for general guidance only. Except the above mentioned items, the contractor have to deploy all other tools & plants required for proper & satisfactory completion of the job. The number of such item will be as per requirement.
44.0	**TIME SCHEDULE**
44.1	The entire balance works of erection and commissioning for Boiler, ESP, Piping etc as detailed in this tender shall be completed within a period of **18 months** from

	the date of start of work.
44.2	The erection and commissioning will be deemed to be completed in all respects, only when the trial runs of individual equipment and testing including floating of safety valves is over and the unit is handed over to customer after successful trial operation with MCR. The decision of BHEL in this respect shall be final and binding on the contractor.
44.3	The contractor should arrange to mobilize and start the erection work within 15 days from the date of LOI from BHEL. **Erection of boiler component will be deemed as start of work of unit at site.** ***However, in case of occurrence of any non-sequential situation, The month of first RA bill to be considered as ZERO MONTH, subject to discretion of Construction Manager, BHEL*.**
45.0	**CONSTRUCTION SCHEDULE**
45.1	The schedule of major milestone activities shall be as under
45.1.1	Start of work – Zero month.
45.1.2	Hydraulic test (Non-drainable) - 6 Months from start of erection.
45.1.3	Light up - 10 Months from start of erection.
45.1.4	Chemical cleaning - 11 Months from start of erection.
45.1.5	Steam Blowing Completion - 12 Months from start of erection.
45.1.6	Synchronisation/Coal Firing of the Unit - 15 months from start of erection.
45.1.7	Completion of works/COD – 16 Months from start of erection including full loading, final painting & handing over.
45.1.8	Completion of Trial Run of the Unit – 17 months from start of erection.
45.1.8.1	Liquidation of pending points and site demobilization – 18 months from start of erection.
45.2	It may be noted that the above schedules are tentative. The exact dates shall be decided based on project requirement. The decision of BHEL in this regard is final and binding.
46.0	**RECTIFICATION / MODIFICATION**
46.1	All rectification/modifications and reworks required for any reasons not due to fault of the contractor on works already completed, which require less than or upto 50 man hours shall be considered as minor and shall be carried by the contractor free of cost.
46.2	BHEL may consider payment for extra works on man hour basis for such of those works which require major revamping / rework and is totally unusual to normal erection or commissioning work which are not due to contractor's faulty erection. The decision of BHEL in this regard shall be final and binding on the contractor. The contractor may submit his extra claim bills (specifically agreed by BHEL Engineer) along with the labour sheet duly certified by BHEL Engineer at site. But BHEL has also got the option to get these works done through other agencies, if they so desire.
46.3	All the extra work, if any, carried should be done by a separate gang which should be identified prior to start of work for certification of man-hours. Daily labour sheets should be maintained and should be signed by contractor's representative and BHEL engineer. Signing of labour sheet does not necessarily mean the acceptance of extra work. Only those works which are identified as not usual to normal erection and certified so by the construction manager only will be considered for payment.
46.4	BHEL has got the option of executing work related to this package but added subsequently on technical requirement / detailed engineering / customer's recommendation either adopting clause through quoted tonnage rate (upto the limit of +/- 15% of the given tonnage) or by adopting either of the following clauses on H.P. joints and man-hr rates at the discretion of BHEL.
47.0	**EXTRA WORK RATE FOR HIGH PRESSURE JOINTS**
47.1	The following are all inclusive rates will be applicable for rectification/modification/rework involving welding of high pressure joints.
47.2	Unit rate per equivalent water wall joint of size OD 63.5 mm x 6.3 mm thick.
	Type of material | Average rate per joint

	Carbon steel	Rs 200.00
	Alloy steel	Rs 250.00
47.3	Notwithstanding the equated rate that can be derived from clause no 53 of terms of payments, extra work rate for HP joints shall be as per the above only.	
47.4	The rate indicated above and below are firm and are not subject to any escalation during the contractor period till the completion of work unit rates for welding are inclusive of joint preparation, cutting, edge preparation, welding and stress relieving, radiography with all consumables , tools and plants, supervision etc.	
47.5	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.	
48.0	**EXTRA WORK RATE FOR ALL CASES OTHER THAN HIGH PRESSURE JOINTS**	
	Shall be as per GCC-1B	
	NOTE: The above man-hour rates towards extra work shall be firm and **not subject to any variation** during execution of the work.	
49.0	**TAXES AND DUTIES**	
49.1	All taxes excluding GST & BOCW Cess (as specified elsewhere in the tender) but including, Charges, Royalties, any State or Central Levy and other taxes for materials if any obtained for the work and for execution of the contract shall be borne by successful bidder and shall not be payable extra by BHEL. Any increase of above at any stage during execution of contract, including extension of the contract, shall have to be borne by successful bidder contractor. Bidder's quoted/ accepted rates/ price shall be inclusive of all such requirements.	
49.2	GST along with Cess (as applicable) legally leviable & payable by successful bidder as per GST Law, shall be paid by BHEL, extra. Hence, bidder shall not include GST along with Cess (as applicable) in their quoted rates/ price.	
49.3	Successful bidder shall furnish proof of GST registration with GSTN Portal covering services under this contract. Registration should also bear endorsement for the prem from where the billing shall be done by successful bidder on BHEL for this project/ wo	
49.4	Since GST on output will be paid by BHEL separately as enumerated above, bidder's your quoted rates/ price should be after considering the Input Credit under GST law at bidder's end.	
49.5	TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills (RA bills) unless exemption certificate from the appropriate authority/ authorities is furnished.	
49.6	TDS under GST (if/ as & when applicable later) shall be deducted at applicable rates on gross invoice value from the running bills (RA bills). However, as on date no TDS under GST is applicable.	
49.7	Bidder shall note that GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred thereunder) wherein the 'Bill To' details shall encompass following. BHEL GSTN- Refer attached BHEL GSTN code Name- BHARAT HEAVY ELECTRICALS LIMITED Address- BHEL Site Office, BARH Super Thermal Power Project, Stage-I, U#1, 2 & 3 (3X660 MW), P.O.- BARH, Distt-Patna, Bihar-803215. Specific details of BHEL GSTN, Name and Address as stated above, have been specified elsewhere in the tender.	
49.8	Successful bidder to intimate immediately on the day of removal of goods (in case of any supply of goods) to BHEL along with all relevant details and send a scanned	

	copy of Tax Invoice to BHEL through following communication mode for enabling BHEL to meet its GST related compliances. Portal address- Shall be intimated later and Email address – Shall be intimated later. Specific details of above shall be intimated to successful bidder by BHEL at appropriate juncture.
49.9	In case of delay in submission of above mentioned documents on the date of despatch, BHEL may incur penalty/ interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from successful bidder, in case such delay is not attributable to BHEL.
49.10	In case of raising any Supplementary Tax Invoice (Debit/ Credit Note), successful bidder shall issue the same containing all the details as referred to in Section 34 read with Section 31 of GST Act & Rules referred there under.
49.11	Successful bidder shall comply with the Time Limit prescribed under the GST Law and rules thereof for raising of the Tax Invoice. If any supply of goods is applicable, successful bidder shall also ensure prompt delivery of goods after despatch.
49.12	Bidder shall note that in case GST credit is delayed/ denied to BHEL due to delayed/ non receipt of goods and/ or Tax Invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons, not attributable to BHEL, GST amount shall be recoverable from successful bidder along with interest levied/ leviable on BHEL, as the case may be.
49.13	Successful bidder shall upload the invoices raised on BHEL in GSTR-1 within the prescribed time as given in the GST Act. Bidder shall note that in case of delay in declaring such invoice in your return and GST credit availed by BHEL is denied or reversed subsequently as per GST Law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from the successful bidder along with interest levied/ leviable on BHEL.
49.14	Way Bill: Successful bidder to arrange for way bill/ e-waybill for any transfer of goods for the execution of the contract. Successful bidder has to make their own arrangement at their cost for completing the formalities, if required, with Issuing Authorities, for bringing materials, plants & machinery at site for execution of the works under this contract, Road Permit/ Way Bill, if required, shall be arranged by successful bidder and BHEL will not supply any Road Permit/ Way Bill for this purpose.
49.15	Any new taxes & duties, if imposed subsequent to due date of offer submission as per NIT & TCN, by statutory authority during contract period (including extension, if the same is not attributable to you), shall be reimbursed by BHEL on production of relevant supporting document to the satisfaction of BHEL. However, you shall obtain prior approval from BHEL before depositing new taxes and duties.
49.16	Benefits and/ or abolition of all existing taxes must be passed on to BHEL against new taxes, if any, proposed to be introduced at a later date.
50.0	**MOBILISATION ADVANCE**
	Not applicable.
51.0	**RATE REVISION**
	RATE REVISION is not applicable.
52.0	**RESPONSIBILITY OF THE CONTRACTOR IN RESPECT OF SAFETY OF MEN, EQUIPMENT, MATERIAL ETC**
52.1	Before commencing the work, the contractor shall appoint / nominate a responsible officer to supervise implementation of all safety measures and liaison BHEL / customer.

52.2	The contractor shall submit a “safety plan” to BHEL. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety of men, equipment, material etc. during execution of the work. The plan shall take care to satisfy all requirements specified hereunder. BHEL shall have right to review and suggest modifications in the safety plan. Contractor shall abide by BHEL’s decision in this respect.
52.3	The contractor shall take all necessary safety precautions and arrange for appropriate protective gears as per direction of BHEL or it’s authorized person to prevent loss of human lives, injuries to men engaged and damage to property etc. Code for safety management at construction site shall also be referred to.
52.4	The contractor shall provide to his work force & ensure the use of the following personal protection equipment as found necessary and as directed and advised by BHEL officials.
52.4.1	Safety helmets conforming to IS 2925 / 1984 (1990)
52.4.2	Safety belts conforming to IS 3521 / 1989
52.4.3	Safety shoes conforming to IS 1989 part – II / 1986 (1992)
52.4.4	Eye and face protection devices conforming to IS 2573 / 1986 (1991),
52.5	IS 6994 / 1973 part – I (1991), IS 8807 / 1978 (1991), IS 8519 / 1977 (1991).
52.6	53.4 All tools, tackles, lifting appliances, material handling equipment, scaffolds, cradles, safety nets, ladders, equipment etc. used by the contractor shall be of safe design and construction. Wherever applicable test certificates for the fitness of these shall be furnished. BHEL will have the right to ban the use of any item found unsuitable.
52.7	All electrical equipment, connections and wiring for construction power, its distribution and use shall conform to the requirements of Indian Electricity Act and rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carry out all types of electrical works. All electrical appliances including portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed.
52.8	For the work in confined spaces, lighting shall be arranged with power source of not more than 24 volts. Alternatively, proper protection shall be provided for use of higher voltage source.
52.9	The contractor shall adopt all fire safety measures as laid down in the “code for fire safety at construction sites” of BHEL and as per directions of BHEL official. A copy of the above referred “code for fire safety at construction sites” shall be made available by BHEL to the contractor for reference.
52.10	Where it becomes necessary to provide and / or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provisions and / or storage in accordance with the rules and regulations laid down by the relevant government acts, such as petroleum act, explosives act, petroleum and carbides of calcium manual of the chief controller in all such matters.
52.11	The contractor shall arrange at his cost (wherever not specified) appropriate illumination at all work spots for safe working when natural day light may not be adequate for clear visibility.
52.12	The contractor shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instructions that may endanger safety of men, equipment, material and environment in his scope of work or another contractors or agencies. Cost of damage, if any, to life and property arising out of such violation of statutory regulations and BHEL instructions shall be borne by the contractor.
52.13	In case of a fatal or disabling injury / accident too any person at construction sites due to lapses by the contractor, the victim and / or his / her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL shall have the right to impose appropriate financial penalty on the contractor and recover the same from payments due to the contractor for suitably compensating the victim and / or his / her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity too the

	contractor to present his case.
52.14	In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover cost of such damages from payments due to the contractor after holding an appropriate enquiry.
52.15	In case of any delay in the completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from payments due to the contractor after notifying the contractor suitably and giving him opportunity to present his case.
52.16	If the contractor fails to improve the standards of safety in its operation to the specification of BHEL after being given a reasonable opportunity to do so, and / or to provide necessary safety devices and equipment or to carry out instructions regarding safety issued by the authorized BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than seven days indicating the steps that would be taken by BHEL.
52.17	The contractor shall submit report of all accidents, fires and property damage, unsafe occurrences to the authorized BHEL official immediately after such occurrence but in any case not later than twelve hours of the occurrence. Such report shall be furnished in the manner prescribed by BHEL. In addition, periodic reports on safety shall also be submitted by the contractor to BHEL.
52.18	**Scaffolding** The Contractor shall take all precautions to prevent any accidental collapse of scaffolding or fall of persons from scaffolding. The Contractor should ensure that scaffolding are designed by a competent person and it erection and repairs should be done under the expert supervision. The scaffolding shall meet the required strength and other requirements for the purpose for which the scaffold is erected. The material used for scaffold should conform to the BIS / International standards.
52.19	**Working at Heights** All working platforms, ways and other places of construction work shall be free from accumulations of debris or any other material causing obstructions and tripping. Wherever workers are exposed to the hazard of falling into water, the Contractor shall provide adequate equipment for saving the employees from drowning and rescuing from such hazards. The Contractor shall provide boat or launch equipped with sufficient number of life buoys, life jackets etc. manned with trained personnel at the site of such work. Every opening at elevation from ground level through which a building worker, vehicle, material equipment etc. may fall at a construction work shall be covered and/or guarded suitably by the Contractor to prevent such falls. Wherever the workers are exposed to the hazards of falling from height, the Contractor shall provide full harness safety belts fitted with fall arresting systems to all the employees working at higher elevations and life line of 8 mm diameter wire rope with turn buckles for anchoring the safety belts while working or moving at higher elevations. Safety nets shall also be provided for saving them from fall from heights and such equipment should be in accordance with BIS standards. Wherever there is a possibility of falling of any material, equipment or construction workers while working at heights, a suitable and adequate safety net should be provided. The safety net should be in accordance with BIS Standards. The Contractor shall provide standard prefabricated ladders on the columns where the workers are required to use them as an access for higher elevations till permanent staircase is provided. The workers shall be provided with safety belts fitted with suitable fall arresting system (Fall arrestors) for climbing/getting down through ladders to prevent fall from height.
52.20	If the Contractor fails in providing safe working environment as per the Safety Rules of BHEL/BRBCL or continues the work even after being instructed to stop the work by the Engineer I/C , the Contractor shall be penalized at the rate of Rs. 25,000/- per day or part thereof till the instructions are complied with and so certified by the Engineer I/C. However, in case of accident, the provisions contained in Sub-Clause below shall also apply in addition to the penalties mentioned in this sub-clause. II If the Contractor does not take all safety precautions and / or fails to comply with the Safety Rules as prescribed by the Employer or under the applicable law for the safety of

	the plant and equipment and for the safety of personnel and the Contractor does not prevent hazardous conditions which cause injury to this own employees or employees of other Contractors, or BHEL/ BRBCL 's employees or any other person who are at the Site or adjacent thereto, the Contractor shall be responsible for payment of penalty to BHEL/ BRBCL as per the following schedule:- a) Fatal injury or accident causing death: Penalty @10% of contract value or Rs. 5,00,000/- per person, whichever is less. b) Major injuries or accident causing 25% or more permanent disablement to workmen or employees Penalty @2.5% of contract value or Rs. 1,00,000/- per person whichever is less. Permanent disablement shall have the same meaning as indicated in The Workmen's Compensation Act' 1923. The penalty mentioned above shall be in addition to the compensation payable to the workmen / employees under the relevant provisions of the Workmen's Compensation Act' 1923 and rules framed there under or any other applicable laws as applicable from time to time.
52.21	If two or more fatal accidents occur at same site under the control of Contractor during the period of contract and he has (1) not complied with keeping adequate PPEs in stock or (2) defaulted in providing PPEs to his workmen (3) not followed statutory requirements / BRBCL safety rules (4) been issued warning notice/s by BRBCL head of the project on non observance of safety norms (5) not provided safety training to all his workmen, the Contractor can be debarred from getting tender documents for two years from the date of last accident. The safety performance will also be one of the overriding criteria for evaluation of overall performance of the Contractors by BHEL/BRBCL. The Contractor shall submit the accident data including fatal / non-fatal accidents for the last 3 years where he has undertaken the construction activities Projects-wise along with the tender documents. This will also be considered for evolution of tender documents. If the information given
52.18	Nonconformity of safety rules and safety appliances will be viewed seriously and the BHEL has right to impose fines on the contractor as under:

Sl no	Safety	Fine (Rs)
01.	Not wearing safety helmet.	50/-
02.	Not wearing safety belt.	100/-
03.	Grinding without goggles.	50/-
04.	Not using 24 V supply for internal work.	500/-
05.	Electrical plugs not used for hand machines.	100/-
06.	Not slinging properly.	200/-
07.	Using damaged sling.	200/-
08.	Lifting cylinders without cage.	500/-
09.	Not using proper welding cable with lot of joints and not insulated properly.	200/-
10.	Not removing small scrap from platforms.	200/-
11.	Gas cutting without taking proper precaution or not using sheet below gas cutting.	200/-
12.	Not maintaining electric winches which are being operated dangerously.	500/-
13.	Improper earthing of electrical T&Ps.	500/-

53.0	**TERMS OF PAYMENT**
53.1	The contractor shall submit his monthly on account bill (RA bill) once in a month at the end of each month covering progress of work on all respects and areas in a calendar month. The RA bill, complete in all respects accompanied by BHEL engineer's certificate / jointly signed measurement sheet will be paid within 60 days of submission of the bill, subject to its completeness & correctness in all respects. The measurement will be taken by BHEL engineer as per relevant clause of GCC

	and certify regarding the actual work executed in the measurement book and bills for work.							
53.2	Out of break-up for progressive payment indicated below, 5% will be retained from each RA bill which will be released on completion of guarantee period of 12 months. However, this balance 5% can be released against submission of performance bank guarantee in the prescribed 'form' which shall be kept valid for the specified period (guarantee period) subject to receipt of certificate that all works are completed in all respects and confirmation of full GST credit to BHEL . This bank guarantee is separate from the bank guarantee towards security deposit and the bank guarantee towards security deposit cannot be utilized for this purpose. The security deposit will be refunded as per GCC.							
53.3	STAGES OF PROGRESSIVE PRO-RATA PAYMENTS							
53.3.1	Subject to the deduction & retention as indicated above, which BHEL may be authorized to make under the contract, the contractor shall, on the certification of the engineer at site, be entitled for payment as explained here under:							
53.3.2	For erection, testing & commissioning of boiler and auxiliaries as detailed in the tender document, progressive payment shall be made as above on the basis of contract price as per rate schedule. The above break-up is only for the purpose of progressive payment and should not be construed as total scope of work.							
53.3.3	The quoted rates per MT for different groups indicated in rate/price schedule shall be distributed in the following manner for releasing payments against RA bills:							
	Stages of payment	**Payment break up**						
		Pr. parts/Trim Piping (SCH-I items of Rate Schedule)	Rotating machine (SCH-I items of Rate Schedule)	Non-pr parts (SCH-I items of Rate Schedule)	ESP (SCH-I items of Rate Schedule)	Piping (incl. P-91) (SCH-I items of Rate Schedule)	BALANCE ALIGN,WELD,BOLT ETC OF ERECTED MATLS AS PER COLM-5 OF APPENDIX-1	BALANCE MILESTONE OF PR.PART. WHERE PRECEEDING JOB COMPLETED AS PER COLM-6 OF APPENDIX-1
		Gr.-I,II	Gr.-III	Gr.-IV& IX	Gr.-V	Gr.-VI & VII	SCH-II items of Rate Schedule	SCH-III items of Rate Schedule
53.3.3.1	**Deleted**							
53.3.3.2	Completion of pre-assembly	15%	----	15%	15%	15%		
53.3.3.3	Placement in position	25%	40%	25%	20%	20%		
53.3.3.4	Alignment, grouting & welding including bolting as required	35%	40%	40%	40%	35%	45%	
53.3.3.5	Completion of non destructive examination & stress relieving / heat treatment	10%	----	----	----	13%	10%	
53.3.3.6	Bolting & completion hangers & supports etc. wherever	----	05%	05%	----	05%	10%	

	necessary							
53.3.3.7	Completion of Hydraulic test	04%	----	----	-----	04%	4%	10%
53.3.3.8	Completion of air & Gas tightness test for equipment	----	----	01%	04%	----		20%
53.3.3.9	Gas distribution test	----	----	----	03%	----		
53.3.3.10	Charging of all field of ESP	----	----	----	05%	----		
53.3.3.11	Boiler light up and ABO	02%	05%	01%	03%	----	4%	10%
53.3.3.12	Completion of acid / chemical cleaning	02%	----	02%	----	----	4%	15%
53.3.3.13	On completion of steam blowing & Safety Valve floating	02%	----	----	----	3%		10%
53.3.3.14	Coal firing	01%	04%	04%	04%	----	5%	5%
53.3.3.15	Full loading	--	03%	03%	03%	01%	5%	5%
53.3.3.16	Submission of as-built drawings.	01%	----	----	----	01%		
53.3.3.17	Liquidation of pending points	01%	01%	02%	01%	01%	2%	10%
53.3.3.18	Reconciliation of issued materials	01%	01%	01%	01%	01%		
53.3.3.19	Completion of all contractual Obligation and de-mobilization of site office.	01%	01%	01%	01%	01%	1%	5%
53.3.3.20	Completion of various misc pending activities of already erected matls like those mentioned in notes point nos. 1a to 1k,appendix-1						10%	10%
	Total	**100%**	**100%**	**100%**	**100 %**	**100%**	**100%**	**100%**
53.3.4	In case the PG Test assistance is not required, the payment towards this will not be considered.							
53.3.4.1	**100%** payment shall be released for **Gr.-XI** (i.e. for PG Test assistance) on completion of the PG test activities.							
53.3.5	Following break-up shall be applicable for **Gr.-VIII (Insulation)** :							
53.3.5.1	Surface preparation/ void closing/ application of bituminous paints/ hook welding, etc						15 %	
53.3.5.2	Application/ erection						60 %	

53.3.5.3	Completion of work, like sheeting, sealing completion, etc	15 %
53.3.5.4	Boiler light up	2%
53.3.5.5	Steam blowing	2%
53.3.5.6	Synchronisation & Coal firing	2%
53.3.5.7	Trial operation	2%
53.3.5.8	Reconciliation and completion of contractual obligations	2%
	Total	**100%**
53.3.6	Following break-up shall be applicable for **Gr.-X(FINAL PAINTING)** :	
53.3.6.1	100% payment shall be made on supply & application of final painting. However, it may be noted that items/components on which final painting has been applied shall be measured & considered for payment purpose. Identification of such components shall be as per direction of BHEL Engineer.	
53.3.7	For all items of work as per Volume-III, Price Schedule, interim payment shall be limited to 95 % of the gross value of interim bill on item rate basis. All admissible recovered/ adjustments etc shall be made from the interim payable amount.	
53.3.7.1	Out of above mentioned 95 % of gross bill value, 1.5 % of gross bill amount shall be paid in the following manner on certification by BHEL engineer after compliance of each of following activity in each month. In case of non-fulfilment of respective activity by vendor in each month, no payment shall be made by BHEL against corresponding activity and no claim of bidder at a later date, whatsoever, in this regard shall be entertained by BHEL.	
53.3.7.1.1	0.7 % shall be paid on compliance of housekeeping including removal of scrap to designated place at yard and/or store/ office areas as directed by BHEL Engineer.	
53.3.7.1.2	0.3 % shall be paid on compliance of general illumination of vendor's working area and stores, office area.	
53.3.7.1.3	0.2 % shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL/ PSER and as specified in the tender.	
53.3.7.1.4	0.3 % shall be paid on compliance of applicable Safety requirement as per guidelines of BHEL/ PSER and as specified in the tender.	
53.3.8	BHEL/BRBCL Nabinagar site at their discretion, may further split up the above percentages and effect payment to suit the site condition, cash flow requirement and according to the progress of work.	
53.3.9	Bidder may please note that payment shall be made through e–mode for which Bank details are to be furnished as per format given in tender.	
53.3.10	GST, shall be released to the vendor upon compliance of following :- a) Vendor declaring such Invoice in his GSTR-1 b) Receipt of Goods/ services and Tax Invoice by BHEL c) Confirmation of payment of GST thereon by vendor on GSTN Portal Above is subject to receipt of goods / service and tax invoice thereof alongwith vendor declaring invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.	
54.0	**RATES/PRICE**	
54.1	The bidder shall quote their rate as per rate schedule given in Volume-III of this specification only.	
54.2	Quoted/accepted rates shall remain valid for +/- 15 % variation in total weight indicated in relevant annexure of weight schedule. Actual tonnage as detailed in the documents of manufacturing units shall be considered for the purpose of billing and payment at accepted unit rates.	
55.0	**LIQUIDATED DAMAGE**	
55.1	If the contractor fails to maintain the required progress of work as per contract or to complete the work and clear the site within the time prescribed by the Contract (Contractual Completion period), he shall without prejudice to any other right or remedy of BHEL on account of such breach, the contractor agrees to pay compensation (penalty) to BHEL. The above agreed compensation shall be a penalty equivalent to **0.5% of the contract price for delay of every one (1) week if the**	

	reasons for delay is attributable to contractor, subject to a maximum of 10 % of contract price excluding elements of Taxes (if quoted by the contractor separately). LD will be applicable for the specific Milestones namely: Boiler Light-up and Synchronization / Coal Firing of Unit. Applicable LD rate and maximum amount of LD shall be same as noted above. In case of LD recovery, the applicable GST shall also be recovered from the vendor.
55.2	BHEL shall deduct the amount of such compensation from any money due or which may become due to successful bidder and/ or recover such compensation from successful bidder's bank guarantees/ security deposit. To be entitled to impose such compensation, BHEL will not be required to prove that they have incurred such amount as actual damage.
55.3	BHEL reserve the right to purchase from elsewhere on account of and at the risk & cost of successful bidder, without notice to successful bidder of the equipment/ materials not so delivered, without canceling the order/ contract in respect of the equipment/ materials not yet due for delivery.
55.4	BHEL reserve the right to cancel the order/ contract or a portion thereof for the stores not so delivered at your risk & cost and successful bidder shall be liable to BHEL for any excess costs thereof.
55.5	Successful bidder shall continue performance of the order/ contract under all circumstances, to the extent not cancelled.
55.6	Where action is taken as per above, successful bidder shall be liable for any loss, which BHEL may sustain on that account. Successful bidder shall not be entitled to any gain on such purchase and the manner and the method of such purchase shall be at the discretion of BHEL. It shall not be obligatory on any part of BHEL to serve a notice of such purchase on successful bidder.
56.0	**PERFORMANCE BOND: Not Applicable.**
57.0	**PRICE VARIATION CLAUSE (PVC)**
	Shall be as per GCC
58.0	**ORC (OVER RUN COMPENSATION)**
58.1	Shall be as per GCC

ANNEXURE-A
(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.

16a EDGE PREPARATION AND FIT UP.

I. Cutting of P-91 material shall be done by hand saw / hack saw / machining / plasma cutting / grinding only.

II. 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.

III. All edge preparation done at site shall be subjected to Liquid Penetration Test. Weld built-up on edge preparation is prohibited.

IV. 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.

V. 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.

16b FIXING OF THETMOCOUPLES AND HEATING ELEMENTS DURING PRE-HEATING AND POST WELD HEAT TREATMENT.

No pre-heating is required for fixing T/Cwith resistance spot welding. Following are the equipment / facilities for heating cycles.

1. Heating Method : Induction Heating

2. Thermo couples : Ni-Cr / Ni – Al of 0.5 mm gauge size.

3. Temp. Recorder : 6 Points / 12 Points.

16c ARRANGEMENT FOR PURGING :

I. 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.

II. 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**.

16d 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.

16e PREHEATING

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.

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.

16f 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.

16g STORAGE OF WELDING CONSUMABLES :

I. Welding consumables are received with proper packing and marking which includes the relevant batch number for easy identification.

II. Electrodes are stored in their original sealed containers / packages until issued and kept in dry and clean environment taking care of shelf life.

III. Welding filler wires are received with proper packing and marking which includes the relevant batch number for easy identification.

IV. The filler wires are stored in original packages until issued and kept in dry and clean environment.

V. 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.

VI. 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.

16h POST WELD HEAT TREATMENT :

I. 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.

II. 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 :

Thickness up to 50 mm	110	deg. Centrigrades
Thickness up to 50 – 75 mm	75	deg. Centrigrades / hr. (max)
Thickness more than 75 mm	55	deg. Centrigrades / hr. (max)

III. 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.

IV. 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.

16i 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 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.

(a) 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.

I. 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.

(c) During cooling cycle after SMAW welding to the holding temperature at 80 to 100 deg. C for one hour.

(d) During post weld heat treatment the following shall be followed

During heating cycle ---- The whole operation to be repeated from the beginning.

During soaking cycle ----- Heat treat (soak) subsequently for the entire duration.

During cooling (above 335 deg. C) --- Reheat to soaking temperature and cool at the required rate.

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.

16j 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 :

a) Pre-Heating
b) Interpass Temperature (GTAW + SMAW)
c) Cooling and holding at 80-100 deg. C for minimum one hour. Start PWHT after minimum one hour of soaking.
d) Heating to PWHT.

16k 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.

16l 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.

16m NON DESTRUCTIVE EXAMINATION

I. Non destructive examination shall be done after PWHT. Prior to testing all welds shall be smoothly ground.

II. 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.

III. LPI penetrant material (Dye penetrant, Solvent cleaner & developer) and medium (dry / wet particles) used in MPI shall be of BHEL approved brands only.

IV. For Ultrasonic Testing calibration blocks used shall be of the same material specification, dia and thickness.

V. 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.

VI. All recordable indications will be stored in memory of digital flaw detector and PC for review at a later period.

VII. 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.

VIII. 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.

16n REPAIR OF WELD JOINTS

(a) 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.

(b) 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:

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.

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.

3) The temperature of the weld is to be maintained at pre-heat temperature.

4) Carry out SMAW using the same procedure as that of welding.

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.

6) The NDE shall be conducted for the entire weld joint.

7) If any further defects are observed on the repaired weld, the same may be further reworked as mentioned above.

16o 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.

16p COMBINATION WELDING

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	Temperature	Soaking Time
P-91 + P-22	745 $\pm$ 15 deg. C	2.5 Minutes / mm (minimum 1 Hr.)
P-91 + X-22	750 $\pm$ 10 deg. C	2.5 Minutes / mm Minimum 2 hour for thickness up to 50 mm and 4 hrs. for thickness more than 50 mm.

Precautions as required for P-91 shall be fully taken care of.

16q SPECIFIC TRAINING FOR WELDERS

I. 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.

II. 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.

16r 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.

16s 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 :

1. The equipment used and its working principle.
2. The procedure to be followed in using heating equipment.
3. Procedures to be followed in case of power failure or equipment non-functioning.
4. Calibration of equipment
5. Method of fixing the thermocouples and compensating cables leading to HT recorder.
6. Fixing of heating pads or elements on the pipe joints and also in maintaining the temperature within the specified limits.

16t 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.

16u 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.

16v DO'S AND DON'T'SDURING P-91 WELDING, HEAT TREATMENT AND NDE AT CONSTRUCTION SITE.

DO'S :

1. Cutting by Band saw / Hack saw / Machining / Plasma cutting.
2. Pipe edge preparation by machining. Machining shall be done without excessive pressure to prevent heating up of pipe.
3. Grinding may be done on exceptional cases taking adequate care to prevent overheating.
4. Thermocouple wire (hot / cold junctions) shall be welded with condenser discharge portable spot-welding equipment.
5. Reserve thermocouples shall be made available, in case of failure of connected thermocouple elements.
6. Ensure adequate Argon gas for complete purging of air inside the pipe before starting GTAW root welding.
7. Ensure preheating at 220 deg. C minimum before GTAW root welding.
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).
9. Do visual inspection on root weld maintaining weld preheat temperature.
10. Continue Argon purging until the GTAW root welding followed by minimum two filler passes of SMAW is complete.
11. Perform partial root welding to facilitate fit-up, if necessary.
12. Ensure that only one layer of root welding using TGS 2CM filler wire is deposited wherever necessary.
13. Ensure proper use of TIG wires as identified by colour coding or suitable hard punching.
14. Keep the GTAW wires in absolutely clean condition and free from oil , rust etc.

15. Dry the SMAW electrodes before use.

16. Ensure inter-pass temperature is less that 350 deg. C.

17. Hold at 80-100 deg. C for a period of minimum 1 Hr. before start of PWHT.

18. Record entire heating cycle on chart through recorders.

19. Exercise control during grinding of weld and adjoining base metal while removing surface surface / sub-surface defects or during preparation of NDE.

20. Ensure no contact with moisture during preheat, welding , post heat and PWHT of weld joints.

21. Ensure removal of Argon purging arrangements after welding.

22. Use short Arc only. The maximum weaving shall be limited to 1.5 times the dia of the electrode.

23. Obtain WPS from equipment / piping supplier (combination welding) for welding of Pipe with equipment.

DON'T'S

1. Avoid Oxy-Acetylene flame cutting.

2. Avoid weld-build up to correct the weld end or to set right the lip of the weld bevel.

3. Avoid Arc strike on materials at the time of weld fit-up during welding.

4. Do not tack weld the thermocouple wires with manual ARC / TIG welding.

5. No GTAW root welding without thorough purging of root area.

6. Do not use Oxy-Acetylene flame heating for any heating requirement.

7. Do not use thermal chalks on the weld groove.

8. Do not stop Argon purging till completion of GTAW root welding and two layers of SMAW.

9. No tack welding or Bridge piece welding is permitted.

10. Do not use unidentified TIG wires or electrodes.

11. Do not exceed the maximum inter-pass temperature indicated in WPS.

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.

13. Do not exceed the limits of PWHT soaking temperature.

14. Do not interrupt the welding / heating cycle except for unavoidable power failures.

15. Do not use uncalibrated equipment for temperature measurement during heating, welding, post-weld heat treatment etc.

16w FACILITY TO BE PROVIDED BY BHEL FOR P-91 WELDING FREE OF HIRE CHARGES :

1. Required No. of Induction Heating Machines with accessories
2. Welding electrodes for P-91 welding.

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.
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.

16x FACILITIES TO BE PROVIDED BY THE CONTRACTOR FOR P-91 WELDING

1. Required numbers of operators / technicians / electricians for installation, commissioning and operation continuously.

2. Gas burner arrangement with required gas for maintaining temperature in the event of power failure.

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. Spot welding Machine for fixing Thermo-couples.
5. EQUOTIP or MICRODUR make or equivalent portable hardness tester.
6. MPI & LPI kit with required consumables.

7. DG Power supply within 500 mtrs. From Boiler (Only for power failure during welding) including necessary cables and switches etc.

8. Consumables :

(i) Glass Fibre Cloth - 1 mm x 1000 mm - Temperature rating 1260 deg. C.

11. Glass Fibre cord - Dia 3 mm (Twisted) - Temperature rating - 1260 deg. C.

12. Ceramic Fibre Blanket - RT Grade, Density 96 KG / Cub. M - Temperature rating - 1260 deg. C.

(iv) Ceramic Fibre rope - Fibre glass braided, dia 12mm - Temperature rating 1260 deg. C.

(v) K- Type Thermocouple - 0.5 mm Dia single strand individual fibre glass insulated.

(vi) Heavy duty TC connectors for K- Type Thermocouples – Size 0.5 mm dia single strand individual fibre galss insulated.

(v) All other consumables / equipment required to carry out the work like annealing cable, Fibre glass cloth,Fibre glass chord,ceramic fibre rope, cartridge for paper temperature recorder & compensating Cable assembly with thermocouple plug as per requirement.

16y TECHNICALLY APPROVED BRANDS BY BHEL / HPBP / TRICHY.
Liquid penetrant , penetrant remover (solvent cleaner) and Aerosol Developer from the same manufacturer considered as a family group.

VENDOR	**PENETRANT**	**BRAND**	
	PENETRANT	DEVELOPER	REMOVER
ITW SIGNODE (I) LTD.	STOPCHECK SKL – SP	STOP CHECK SKC – 1	STOP CHECK SKD – S2
P – MET CO.	FLAW CHECK I) PP – 31A II) PP – 131A	FLAW CHECK I) PP – 15 II) PP – 110	FLAW CHECK I) PP- 21 II) PP – 120
CHECKMATE CHEM.	CHECKMATE	CHECKMATE	CHECKMATE

PVT. LTD. SUPER SUPER SUPER

PT – 97 CL – 96 DV – 98

PRADEEP METAL FLAW GUIDE FLAW GUIDE FLAW GUIDE
TREATMENT GP GP GP

FERRO CHEM CRACK CHECK CRACK CHECK CRACK CHECK
FC – 911 FC – 911 FC – 911

DRY MAGNETIC POWDER :

1. MAGNAFLUX - PRODUCT GREY , 8A -- RED

2. FERROCHEM PRODUCT NO. 256

3. K – ELECTRONICS PRODUCT -- RD -- 200 (SPECIAL)

NON – FLOROSCENT MAGNETIC INK
(PREPARE BATH AS INSTRUCTED BY SUPPLIER)

1. MAGNAFLUX -- PRODUCT 9C RED WITH MX/MG CARRIER II OIL VEHICLE.

2. FERROCHEM -- PRODUCT NO. 146A WITH OIL VEHICLE (WITH HIGH FLASH POINT 92 DEG. C.)

3. SARDA MAGNA CHECK INK WITH OIL VEHICLE (WITH HIGH FLASH POINT 92 DEG. C)

FLUOROSCENT MAGNETIC INK
(PREPARE BATH AS INSTRUCTED BY SUPPLIER)

1. MAGNA FLUX -- PRODUCT 14 A WITH MX/MG CARRIER II OIL VEHICLE.

2. MAGNA FLUX -- PRODUCT 14 AM - PREPARED BATH OF 14 A
AND MG / MX CARRIER-II READY TO USE WITHOUT MEASURING AND MIXING IN AEROSOL CONTAINER WITH MX/MG CARRIER-II OILL VEHICLE.

ANNEXURE – B

DETAILS OF QUANTITIES

ESTIMATED WEIGHT OF VARIOUS PRODUCT GROUPS FOR EACH UNIT

SUMMARY OF BALANCE WORKS

PRODUCT GROUP (PG)	DESCRIPTION OF PG	DESIGN WT.- MT	BALANCE WORK (MT) w.r.t. Design Weight	WT DETAILS FOR ALIGN/ WELD BOLTING/GROUTING ETC. OF ERECTED MATLS.(MT) (IN ADDITION TO COL-4)	WT DETAILS FOR AREAS INVOLVED IN ACHIEVING SUBSEQUENT MILESTONE (MT) (IN ADDITION TO COL-4 & 5)
1	2	3	4	5	6
	GROUP-I : PRESSURE PARTS				
4	BOILER DRUM WITH INTERNALS	151.09	4.06	0	147.03
5	WATER WALL HEADERS	64.09	1.26	0	62.83
6	WATER WALL PANELS	328.22	1.68	1.46	325.08
7	SUSPENSION,RT, LOOSE TUBE,DOWN COMER(ALL BUT PANEL&HDR IN 1ST PASS)	291.52	38.24	23.54	229.73
8	BUCKSTAYS & FURNACE GUIDES	255.57	61.64	18.25	175.68
9	SEAL BOXES FOR FURNACE OPENING & INSTRUMENT INSERTS	8.12	6.64	1.48	0
10	SUPER HEATER HEADERS	87.48	0	2.81	84.67
11	SUPER HEATER COILS	556.52	2.47	80.09	473.96
12	SH SPACER TUBES, SAT. LINKS, DESH & DESH LINKS, SH HANGERS & SUPPORTS	226.67	92.51	18.25	115.90
15	REHEATER HEADERS	21.45	0	4.39	17.06
16	REHEATER COILS	147.80	0	0	147.80
17	REHEATER LINKS & SUSPENSIONS	31.13	1.92	0.58	28.63
18	FURNACE ROOF SKIN CASING	12.90	12.90	0	0

19	ECONOMISER COILS, HEADERS & PIPES	354.58	10.56	91.15	252.87	
20	SOOT BLOWERS	36.45	18.56	17.90	0	
28	FURNACE DOORS & FASTENERS	8.99	8.99	0	0	
31	SKIN CASING & COMPONENTS	10.73	10.73	0	0	
97	MTM CLAMPS AND PADS	.14	**.14**	**0**	**0**	
	SUB TOTAL	**2593.46**	**272.30**	**259.91**	**2061.26**	
	GROUP-II : INTEGRAL/TRIM PIPINGS					
21	SOOT BLOWING STEAM PIPING	15.23	15.23	0	0	
24	BOILER TRIM PIPING, SAFETY VALVES, SILENCERS, NAME PLATES ETC.	156.60	90.78	0	65.83	
42	OIL SYSTEM PIPINGS	114.35	114.35	0	0	
	SUB TOTAL	**286.18**	**220.35**	**0**	**65.83**	
	GROUP-III : ROTATING MACHINES					
50	STEAM COIL AIR HEATER	13.66	13.66		NOT APPLICABLE	
52	ROTARY REGENERATIVE AIR HEATER	593.03	307.74	270.49		
55 & 56	FD, ID, PA & SA FANS WITH SUB-DELIVERIES	229.09	229.09			
MOTORS	MOTORS (ID,FD ,PA ,MILLS, ETC	116.25	116.25			
60,61	COAL MILLS & SUB-DELIVERIES	833.06	833.06			
65	COAL FEEDERS	51.90	51.90	0		
	SUB TOTAL	**1839.44**	**1554.14**	**270.49**		
	GROUP-IV : NON-PRESSURE PARTS & STRUCTURE					
30	MAIN BOILER ENCL.	95.53	95.53	0	NOT APPLICABLE	
35	MAIN BOILER STRUCTURES	2022.51	140.39	0		
36	BOILER MAIN FLOORS, STAIRS & LADDERS ETC.	1148.13	627.26	0		
38	INTERCONNECTING STRUCTURES & PLATFORMS	510.27	444.70	0		

39	COLUMNS & FRAMES FOR DUCTING, FAN HANDLING STRUCTURES ETC.	775.31	775.31	0	NOT APPLICABLE	
41	OIL & GAS BURNERS, IGNITORS ETC.	2.66	2.66	0		
43	IGNITOR, SCANNER & SEAL AIR SYSTEM	48.84	48.84	0		
45	COAL BURNERS	72.58	6.37	0		
47	PULVERISED FUEL PIPING & SUPPORTS	524.71	417.15	107.56		
48	AIR DUCTS, FLUE GAS DUCTS, EXPN. JOINTS, DUCT SUPPORTS ETC.	1182.75	1182.75	209		
57	GATES, DAMPERS	309.34	309.34	0		
67	MILL PLANT AUXILIARIES	58.99	58.99	0		
80	MISC TEMP.PPG FOR ACID CLEANING /STEAM BLOWING, H& S, ETC	88.47	88.47	0		
99	MISC. HANDLING EQUIPMENT	31.42	31.42	0		
	SUB TOTAL	**6871.52**	**4229.18**	**107.56**		
	GROUP-V : ELECTRO STATIC PRECIPITATOR					
79	ESP	4336.48	4336.48	0	NOT APPLICABLE	
89	ESP GALLERIES& STAIRS	103.21	103.21	0		
HVR	TRANSFORMER	100.62	100.62	0		
	SUB TOTAL	4540.32	4540.32	0		
	GROUP-VI : PIPING (EXCEPT P-91 PIPING)					
22	HPBP OIL SYSTEM	4.09	4.09	0	NOT APPLICABLE	
80	PIPING& SUPPORT	1337.69	1256.80	0.99		
81	TANKS	30.88	30.88	0		
BHOPAL	VALVES	6.65	6.65	0		

PEM	VALVES	18.33	18.33	0	NOT APPLICABLE	
	SUB TOTAL	1397.64	1316.75	.99	NOT APPLICABLE	
	GROUP-VII : PIPING (P-91)					
80	PIPING	81.97	81.97	0	NOT APPLICABLE	
	SUB TOTAL					
	GROUP-VIII : INSULATION					
32	FIXING COMPONENTS FOR INSULATION (ONLY ATTACHMENTS TO PR. PARTS & PIPING)	123.25	123.25	0		
33	BLR PR PARTS MINERAL WOOL	646.82	646.82	0		
37	BLR OUTER CASING COMPONENTS	43.10	43.10	0		
81	INSULATION WOOL-PIPING CENTRE	369.14	369.14	0		
PE	INSULATION WOOL-PEM	126.13	126.13	0		
	SUB TOTAL	1308.44	1308.44	0	NOT APPLICABLE	
	GRAND TOTAL IN MT	**18918.97**	**13526.74**	**638.94**	**2127.09**	

PGMA WISE DETAILS OF BALANCE ERECTABLE ITEMS AND LEFT OVER JOBS ARE GIVEN IN ANNEXURE – B OF THIS TENDER DOCUMENT.

ALSO ACTIVITY WISE STATUS IN SOME AREA IS ATTACHED FOR REFERENCE IN **APPENDIX- II** .

ALL THE DETAILS NOTED IN THE ANNEXURE SHEETS ARE INDICATIVE ONLY AND THE ACTUAL BALANCE JOB IS NOT LIMITED EXCLUSIVELY AS PER THESE LISTS. SCOPE OF WORK FOR THIS TENDER IS TO COMPLETE THE UNIT#4 SG SYSTEM AS PER DRAWINGS AND SATISFACTION OF ENGINEER IN-CHARGE AND FINALLY HANDING OVER THE SYSTEM TO CUSTOMER.

NOTES FOR COL.5 & 6 OF APPENIX-I:

1. **Bidders are advised to fully inspect the boiler and auxiliaries physically for their own assessment of the present status and pending works before quoting their rates/prices. Particularly for following miscellaneous activities apart from tonnage shown in bill of**

quantity:

a) To ascertain for completion in Pr. Parts, structure, ducts, coal pipings rotary parts: i) balance welding after alignment & bolting ii) balance alignment/bolting after placement and iii)also materials lifted on various platforms but not erected in actual position IV) balance internal reinforcement supports of preassembled ducts (approximately 15% of total supports may be assumed as balance in preassembled ducts). One no Final SH coil (11-274, DU-004) is pending for erection. For inserting the coil, butter fly panel may have to be cut and already erected coils may have to be readjusted. All arrangement for erection of this coil has to be done by the vendor.

b) Assessment and completion of balance supporting of erected materials such as pressure part and piping, etc.

c) There are certain structures which have been removed after erection for making access to erect other items but not re-erected. Same are to be erected, aligned and welded.

d) Some of the cantilevers in front and rear of the boiler which were temporarily erected for drum lifting but not dismantled. These structures are to be dismantled in line with drawings/site requirement.

e) All balance temporary supports etc fixed for alignment & welding works of already completed works in different area of boiler are to be removed to make furnace and other system independently suspended/hold on their permanent supports.

f) All temporary ladders, angles ,rods etc on already erected materials to be removed properly for painting work.

g) Lot of Structure, duct, rotary parts, pr. Parts, piping and other plant materials are drawn from stores and lying around boiler # 4, ESP and around the stores of the previous agency deployed by BHEL in unit-4 boiler. Same are to be identified/recorded, and properly re-stacked before start of erection. Necessary Preservations as required has to be done in this regard.

Major erection of balance three units (U#1,2&3) has been erected and boiler components are stored in different locations inside the project. The contractor shall assist in identification of the materials and shall maintain a dedicated group of people of minimum five persons and provide support from available resources. In the process, required material identification vis-a-vis availability to be prepared to identify shortages of material for balance activity and brought to notice of BHEL well in advance. This job has to be completed priority wise as per direction of BHEL Engineer and report shall be prepared and submitted on weekly basis.

In case of non-deployment of this dedicated group for materials tracing and identification purpose by the agency BHEL shall have the right to deduct the equivalent amount for non-deployment of man-power on monthly basis calculated on the basis of payable amount of Rs. 12000.00 per man-month. Non-deployment of man power will be counted with the consideration of deployment requirement of five persons for maximum 30 (Thirty) man-months.

h) At some locations erected structures are fouling with other system/creating movement obstructions. These structures are to be removed /modified as per BHEL recommendation.

i) Duct of some area like BOF to ESP(RHS), ID to Chimney- LHS, FD to APH ,some of the structure and certain portion of piping are already pre-assembled and kept in previous agencies fabrication yard. Same is to be taken in to records before erection. Completion of balance activities of supporting, welding etc & K-oil test before erection to be carried out. In addition to the radiography of new joints in PP/Piping, radiography of already erected joints approximately 300 nos in PP & 30 joints in Piping to be carried out by the contractor including subsequent repair if any. No separate payment will be made in this regard.

j) Removal of all existing scraps from various boiler floors and zero meter area and disposal of same to scrap yard as per advice of BHEL

K) Major plant materials of U#4 has already been received at site from respective manufacturing units, except Insulation wool/refractory and certain open order items. Contractor to directly unload, receive, preserve these balance items received from manufacturing units/ other BHEL sites time to time. (Above are description of the balance works and the total weight indicated in column-3 to 6 of Annexure-B are indicative for assessment of works to be done in respective category. Contractor has to complete the all balance works found during execution even if they are not figuring above **and elsewhere in this tender document.**

ANNEXURE-C

LIST OF T&P TO BE PROVIDED BY CONTRACTOR

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

01	a) 100T (or above) Crawler Crane	1 no.
	b) 25 T Mobile crane	1 no
02	Crane 12 T Hydra	As per requirement
03	Passenger cum goods elevator (within 01months of LOI)	1 no
04	Tractor-trailor 30T (with long bed)	1 no
05	Tractor-trailor 12T/15T (with long bed)	2 no
06	Truck 10T	1 no
07	Wheel barrows	1 no
08	Electrical winch 8T	2 no
09	Electrical winch 5T	3 no
10	Electrical winch 2T	5 no
11	Electrical winch 1T	5 no
12	Deleted	As per requirement
13	Chain pulley block 5T, 3T, 2T	
14	Pull lift 6T, 5T, 3T, 1.5T	
15	Multipurpose pulling and lifting m/c 5T, 3T, 1.6T	
16	Hydraulic jack 100T, 50T, 20T, 10T, 5T	
17	Single sheave snatch pulley 10T, 5T	
18	Double sheave snatch pulley 10T, 5T	
19	D shackles 10T, 20T, 50T	
20	Turn buckles 3T, 5T, 8T, 10T, 15T, 20T	
21	Welding generator K320	
22	Oil cooled welding transformer 300 amp, 450 amp	
23	Air cooled welding transformer 300 amp	
24	Stress relieving transformer 600 amp	
25	TIG welding torch air cooled	As required
26	TIG welding torch water cooled	
27	High frequency unit	
28	Oxygen regulator	
29	Acetylene regulator	
30	Cutogen 5	
31	Oxygen hose 10 mm	
32	Acetylene hose 10 mm	
33	Electrode drying oven	
34	Portable electrode drying cabinet	
35	Copper welding cable 600 amp, 400 amp	
36	Aluminium cable 600 amp, 400 amp	
37	Temperature recorder	
38	Thermochalk 100 deg C to 800 deg C	
39	Air compressor 250 cfm, 80 cfm	
40	Stationery compressor 350 cfm	
41	Filling pump 80 M head, 15 ltr/sec (at least one month prior to Hydraulic test)	
42	Electrode baking oven	
43	Vernier theodolite - 1 sec accuracy	
44	Dumpy level	
45	Spirit level 12 inch, 0.1 mm accuracy	
46	Combination squares	
47	Micrometers of different sizes	
48	Vernier callipers of different size	

49	Dial guage	
50	Flood light with bulb	
51	Step down transformer	
52	Drilling m/c of different sizes	
53	Megger for Insulation Resistance testing purpose. (1000 Volt)	
54	Tong tester	
55	Grinding m/c of different sizes	
56	Chamfering m/c of different sizes	
57	Trip torque wrench	
58	Aluminium telescopic ladder	
59	Manila ropes of different sizes	
60	Steel wire ropes of different sizes	
61	Drawing board	
62	Radiography equipment	
63	Moving platform	
64	Magnetic particle test equipment	
65	Ultrasonic flaw detector	
66	Dye Penetrant test kit	
67	Sheet grooving m/c for outer sheet casing	
68	Sheet bending m/c for outer sheet casing	
69	Recordable ultrasonic test equipment (UFD Krauft Kammer make USN-50 or higher version to meet the requirements)	1 Set.
70	Radiography arrangement including source- IR 192	1 Set.
71	Mechanized hydraulic pipe bending machine with die of various sizes	1 Set.
72	Gas burner arrangement	1 Set.
73	Hardness tester	1 Set.
74	Spot welding machine	1 Set.
75	DG set of required capacity for P91 welding	1 Set.
76	Portable alloy analyser/ PMI machine, Handheld type(as per requirement)	Digital, robust (Gun type), 1 no

NOTE:-

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

ANNEXURE - D

LIST OF T&P TO BE MADE AVAILABLE ON SHARING BASIS BY BHEL FREE OF ANY CHARGES

Sl no	Item	Capacity	Quantity
1	Crawler crane	80T/75T or equivalent	1 no
2	Induction Heating Equipment along with accessories	As required	As required
2	EOT crane in TG hall (if required)	As installed	As required
3	Hydro test pump	0-450 kg/sqcm	1 no
4	Chemical circulating pumps	As required	As required
5	Air Blower	As required	1 no.
6	Huck Bolting Machine	As required	1 no.
Note:-			
01	The above T&Ps will be made available for the project. Contractor may make use of the T&Ps as per the provision of tender document.		
02	All other T&Ps required for proper execution of the job shall be provided by the contractor.		
03	All the T&P listed above shall be issued and used as per relevant clause in the contract.		

ANNEXURE- E

(WORK STATUS FOR REFERENCE IN CRITICAL AREA)

APPROX. MAJOR BALANCE ACTIVITY OF PR. PARTS, TRIM PIPING, BOILER STR. COAL PIPINGS, IN RESPECT OF ANNEXURE-B:

	APPROX. BALANCE ACTIVITY - IN STR. & PP ATTACHMENT ETC IN ERECTED COMPONANTS BLR #4 , 4X250 MW BRBCL NABINAGAR	
Sl no.	**MAJOR BALANCE ACTIVITY IN BOILER**	**Remarks**
A	**FURNACE AREA :**	
1	Buckstay connections of furnace & Insul. Cleranece	
2	Leveller guides – Furnace and 2nd pass	
3	Furnace guides	
4	S-pnl str. Members	
5	Header guide	
6	Welding inside furnace – Corners, S-pnl balance fins etc.	
7	Crown plate end bar connection	
8	Roof alignment	
9	Header alignment (partially)	
10	Top suspension (partially)	
11	Pressure part attachments, cassete baffle, mechanical spacer, protection shield	
12	Wind box suspension	
13	Seal box	
14	Doors	
15	Boiler enclosure(In roof area, Rear Arch area, S-Panel area)	
16	Furnace bottom sealing	
17	Safety valves	
18	Trim Piping	
19	One no Final SH coil (11-274, DU-004) is pending for erection.	
B.	Balance welding of erected structure (Light & heavy wts),coal pipes etc mainly from but not limited to PG35,36,38,47 etc	**1000 RM approx.**

THE ABOVE DESCRIPTIONS ARE INDICATIVE AND FURNISHED FOR GENERAL IDEA ABOUT THE MAJOR WORKS LEFT IN ERECTED COMPONENTS/ TOTAL BALANE.ACTUAL ACTIVITY AS FOUND BALANCE IS TO BE COMPLETED BY THE CONTRACTOR DURING EXECUTION.

2. STATUS OF ROTARY PARTS:

A) ROTARY APH ACTIVITY STATUS

STATUS OF ROTARY APH-4A IN BLR #4				
MAJOR ACTIVITIES	**APH-4A**			
Bracing pipes fitting	Completed			
S.Brg, Guide brg, amd Rotor levelling after module loading	Completed			
Axial spacer bar assy fitting	**BALANCE**			
Pin rack assy	**BALANCE**			
Rotor drive assy	**BALANCE**			
Air line components	**BALANCE**			
Rotor angle & T- Bar assy (CE)	**BALANCE**			
Rotor angle & T- Bar assy (HE)	**BALANCE**			
S.Brg, Guide brg & Rotor levelling before seal setting	Completed			
Sec. pl. levelling (CE)	**BALANCE**			
Sec. pl. levelling (HE)	**BALANCE**			
Axial seal plate setting	**BALANCE**			
Axial seals setting	**BALANCE**			
By pass seals (CE)	**BALANCE**			
By pass seals (HE)	**BALANCE**			
Rotor post seals (CE)	**BALANCE**			
Rotor post seals (HE)	**BALANCE**			
Radial seals(CE)	**BALANCE**			
Radial seals(HE)	**BALANCE**			
Static seal setting & welding (CE)	**BALANCE**			
Hydraulic testing of guide brg adaptor sleeve	**BALANCE**			
Static seal setting & welding (HE)	**BALANCE**			
S.Brg, Guide brg & Rotor levelling (Final)	**BALANCE**			
Axial seal plate to sec plate seal (CE&HE)	**BALANCE**			
LOS Placement (Sup. Brg)	**BALANCE**			
LOS Placement (Guide Brg)	**BALANCE**			
LOS pipings Fitting and welding (Guide brg)	**BALANCE**			
LOS pipings Fitting and welding (Supp. Brg)	**BALANCE**			
Acid cleaning of LOS pipings (Guide brg)	**BALANCE**			
Acid cleaning of LOS pipings (Support brg)	**BALANCE**			
Trial of LOS Guide brg	**BALANCE**			
Trial of LOS Support brg	**BALANCE**			
Man hole door fitting and welding	**BALANCE**			
Seal air piping fitting and welding	**BALANCE**			
Water wash and deluge assy erection	**BALANCE**			
Soot blower assy	**BALANCE**			
Rotor stoppage alarm	**BALANCE**			
Fire sensing alarm device	**BALANCE**			
Observation port and light assy	**BALANCE**			
Oil carry over detector	**BALANCE**			
Air receiver tank erection and fittings	**BALANCE**			
Arrangement of Servicing beam assy.	**BALANCE**			
Pre commissioning check	**BALANCE**			
Trial run	**BALANCE**			

B) ***ALL OTHER DRIVES STATUS :*** **100% ACTIVITY BALANCE.**