CONTENT

The technical specification, scope etc in this volume shall be construed as part of tender document and shall be read along with general conditions of contract (GCC), special conditions of contract (SCC). In case of any conflict or inconsistency between the GCC, SCC and this Volume-II, the same shall be brought out by the bidder in writing to BHEL for clarification, failing which most stringent interpretation/ clause in favour of BHEL shall be adopted and the same shall be binding to the bidder.

CLAUSE NO	DESCRIPTION
1.0	**BROAD SCOPE OF BALANCE WORK**
1.1	**Unit#1 of 3x 660 MW, Stage-I, Barh STPP**
1.1.1	Making arrangment for and carrying out fit-up, welding, NDT, PWHT, repair of left out joints, insulation, str.platform, valves, SS piping, GI piping etc.
1.1.2	Scope also covers Electrical, C&I (cabling and cable tray works etc.) and insulation works as detailed in attached NTPC tender specifications. Electrical/ C&I shall be mainly covering actuators and instruments mounted on the pipeline systems being erected by the vendor.
1.1.3	PG Testing of system, completion of punch points and assistance for handing over of unit to customer. PG Test Impulse piping from root valve, Cabling of field instruments for PG test. All assistance of issue of materials, return after PG test, assistance during PG test is in the scope of vendor. System Isolation, flushing of root valves etc. during PG test is in the scope of vendor
1.2	**Unit#2 of 3x 660 MW, Stage-I, Barh STPP**
1.2.1	Receipt of Materials from BHEL Store/yards/other designated places and transportation to erection site.
1.2.2	Grouting of skids, painting of all equipments along with supply of required materials, machineries and other resources as required to carry out the job.
1.2.3	Arranging statutory co-ordination for IBR related activities.
1.2.4	Erection, Commissioning of HP piping, HPBP valves, LP Bypass System with Valves, servomotors and other systems tanks and equipments as per scope.
1.2.5	Erection and Commissioning of Various auxl. Piping system as per relevant annexure including erection & commissioning of valves, erection of fittings and other associated instruments.
1.2.6	Erection and Commissioning of MS, HRH Strainers, CRH-NRVs, Extraction NRVs with associated pipelines etc.
1.2.7	Preservation of piping components after receipt from BHEL Store.
1.2.8	Hydro Test & Chemical cleaning/Steam Blowing and associated testing plus related activities of different system and normalization including laying of temporary piping & dismantling/return of the same to BHEL stores after comopletion of the activities.
1.2.9	Arrangement of fixing of steam blowing and hydro-test blanks and restoration.
1.2.10	Arrangement for hydro-test/steam blowing in strainers including removal/restoration in MS & HRH lines etc.
1.2.11	Flushing, steam blowing , related testing, pre-commissioning, commissioning activities of oil system, etc. This includes preparation for flushing,hydro-test, chemical cleaning, steam blowing, other cleaning activities , actual execution of the activities, normalisation etc.
1.2.12	Fabrication and erection of various approach platforms for valves & equipment as per direction of BHEL.
1.2.13	Preparation of MIRs, following of safety and quality norms and documentation , preparation of material status and up-gradation of activities, networks at regular intervals.
1.2.15	Trial run of equipments, systems 660 MW Unit as a whole .
1.2.16	Scope also covers Electrical, C&I (cabling and cable tray works etc.) and insulation works as detailed in attached NTPC tender specifications. Electrical/ C&I shall be mainly covering actuators and instruments mounted on the pipeline systems being

	erected by the vendor.
1.2.17	PG Testing of system, completion of punch points and assistance for handing over of unit to customer. PG Test Impulse piping from root valve, Cabling of field instruments for PG test. All assistance of issue of materials, return after PG test, assistance during PG test is in the scope of vendor. System Isolation, flushing of root valves etc. during PG test is in the scope of vendor
2.0	**GENERAL REQUIREMENTS**
2.1	The balance job to be executed under the specification covers handling at sitestores/storageyard, transportation to site of work, unloading at site, erection, testing, commissioning and handing over of U#2 at Barh Stg-I (3x660MW) project and all jobs as specified in tender specification from Sysnchronisation to Full load of U#2 at Barh Stg-I (3x660MW) project .The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship for fabrication, engineering and construction management. The vendor should ensure timely completion of work. The vendor must have adequate quantity of tools, construction aids, equipments etc, in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel. The entire work under this scope shall be directly executed by the vendor with their own resources; BHEL Engineers shall be available only in advisory capacity. The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation. The terminal points indicated by BHEL should be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.
2.2	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of BHEL, BHEL's customer, customer's consultants and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.
2.3	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.
2.4	All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory / local authorities are to be arranged by the contractor at his cost in time to ensure smooth progress of work.
2.5	The work shall conform to dimensions and tolerances specified in the various drawings/documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to contractor's fault, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by BHEL and recoveries will be effected from the contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL.
2.6	The contractor shall perform any services, tests etc. which may not be specified but nevertheless required for the completion of work, within quoted/ accepted rates.
2.7	All necessary certificates and licenses required for carrying out this work are to be arranged by the contractor expeditiously.
2.8	The contractor shall execute the work in the most substantial and workmanlike manner. The stores shall be handled with care and diligence.

2.9	BHEL reserves right to recover from the contractor any loss which arises out of undue delay / discrepancy / shortage / damage or any other causes due to contractor's lapse during any stage of work. Any loss to BHEL due to contractor's lapse shall have to be made good by the contractor.
2.10	All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors / Engineers, consumables etc. except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the contractor. All expenditure including incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clauses. The contractor's quoted rates should be inclusive of all such contingencies.
2.11	During the course of erection, testing and commissioning, certain rework / modification / rectification / repair / fabrication etc. may become necessary on account of feedback / revision of drawing. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc. promptly and expeditiously. Daily log sheets signed by BHEL Engineer and indicating the details of work carried out, man-hours etc. shall be maintained by the contractor for such reworks. Claim of contractor if any, for such work will be governed by relevant clause under extra work, provided the reasons for rework are not attributable to contractor, as decided by BHEL.
2.12	The contractor shall make all fixtures (like bolt stretching devices, alignment devices, gas tightness/hydraulic test devices etc.), temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Necessary steel and other materials shall have to be arranged by the vendor within the quoted rate. No separate payment shall be released to the vendor on this account.
2.13	The contractor shall take delivery of the components, equipments, chemicals, lubricants etc. from the BHEL stores / storage area after getting the approval of BHEL Engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to the BHEL and reconciled periodically. The contractor shall check, tally and inspect all material consignment issued to him and shall maintain proper record or the receipt of material received and such reports shall be produced by the contractor to the Engineer for verification. Any deviation from packing list or damage to any component noticed during receipt of material should be immediately brought to the notice of BHEL engineer. Any claim in this regard after receipt of material by the contractor will not be entertained.
2.14	Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas / site to enable other agencies to carry out their work or for any other reason, same shall be done by contractor most expeditiously. No claim for extra payment for such work will be entertained.
2.15	Plant materials should not be used for any temporary supports /scaffolding/preparing pre-assembly bed etc. All scaffoldings to be used will be of steel only and no wooden/bamboo will be allowed. Strict safety norms are to be followed as per safety plan of BHEL/CLIENT.
2.16	Spring suspension / constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests / locks, cutting of excess thread length of hanger tie-rod etc. have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents / instructions, during various stages of erection & testing and after floating of piping / ducting during cold and hot condition will have to be done. This exercise may have to be repeated till satisfactory results are

	achieved.
2.17	Layout of field routed / small bore (up to NB100) piping shall be done as per site requirement. Necessary sketch/layout for routing these lines should be got approved from BHEL by the contractor. There is a possibility of changes in routing the above pipelines even after completion of erection which shall be done by contractor as part of work without any extra claim.
2.18	Welding of necessary instrumentation tapping points, root valves, condensing vessels, flow metering & measurement devices and control valves, PG test tapping points and instruments, flow nozzles to be provided on piping & its auxiliaries are covered within the scope of this specification. The installation of all the above items will be contractor's responsibility even if: a) Items are not specifically indicated under the respective product groups as given in the technical specifications. b) Items are supplied by an agency other than BHEL. Pre-heating, NDE and post weld heat treatment for above shall be done as per the specifications as part of work.
2.19	Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal / speed switches of motors, accumulators etc. are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration and hand over the same to BHEL. Storage / re-erection, calibration will be done by C & I erection agency. Re-erection has to be done by the contractor within the quoted rate. This exercise may have to be repeated as per the site requirement. No payment on whatsoever ground on this account shall be entertained by BHEL.
2.20	Fixing and seal welding of thermowells & plugs before hydro test / steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermo wells after hydro test / steam blowing of lines as part of work.
2.21	Actuators / drives, valves etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.
2.22	In installation of various equipments it may become necessary to install these on temporary supports / hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions / hangers and later on shift the relevant equipments to their respective permanent hangers / suspensions / supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free of cost and returnable basis. The same shall be returned to BHEL after the use. No extra payment shall be done by BHEL on this account and normalisation is also included in the vendor's scope of work within the quoted rate.
2.23	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 within the quoted rate.
2.24	Minor adjustments like removal of ovalties 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.
2.25	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. The pipes and related fittings may have to re-dressed to suit fitting, welding within the quoted rate by the vendor.
2.26	Dewatering arrangements (of sufficient capacity) in condenser pit, low point areas, basement floors and other areas where erection is in the scope of the vendor are to be arranged by the contractor within the quoted rate and this facility is to be maintained by the contractor till handing over of the Unit to the customer. No claims for whatsoever reason on this account shall be entertained by BHEL. In case of non-availability of the same facility at any point of time, the same shall be arranged by BHEL at the risk and cost of the contractor.
2.27	Cutting and edge preparation of critical pipe If required during erection shall be done by contractor without any additional cost implication to BHEL.
2.28	If stub's (temperature stub, vent and drain stub) are missing physically on pipe, same shall be rectified as per guidance of site engineer, by contractor without any additional cost implication to BHEL.
2.29	The Vendor has to carry out transportation of lube oil, special consumables, etc. from BHEL/Customer's stores, filling of lubricants, etc. and filling of oil for flushing, first filling and topping up oil till handing over to BHEL/NTPC is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of contractor.
2.30	All packing and forwarding material shall be returned as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL Engineer.
2.31	All Measuring and Monitoring Devices (MMD) used for the work in scope of this tender specifications, shall be calibrated by the accredited agencies who are approved by BHEL or calibration traceability is established upto National Physical Laboratory for proper validity from time to time.
2.32	Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis and take prior approval as specified elsewhere.
2.33	For erection, testing and commissioning of different hoists (mechanical and electrical), other handling arrangements, the contractor has to arrange the services of accredited agency (who are authorised to witness and issue certificates by Govt. agency for hoists etc.) within their quoted rate for statutory load testing and issuing of certificates for safe use of these items. Necessary loads for carrying out such load testing shall be issued by BHEL/Customer at free of cost. However, the contractor has to arrange necessary transport and handling and return the load testing materials within the quoted rate.

2.34	Area Cleaning – The contractor has to do area cleaning on every date on dailybasis.The cleaning has to be done during start of the day and at the end of the day .Non compliance of the above cleaning shall call for penal recovery of Rs.2000.00 on each instance and at the same time, cleaning of the area shall be done by BHEL at the risk and cost of the contractor. No excuses on this above account shall be entertained by BHEL on whatsoever account. Following activities shall be normal scope of work without any additional cost implication to BHEL.
2.34.1	Breaking of floor and wall with jack hammer is in Contractor scope if opening is not available.
2.34.2	Approach platform of all valves if required are in Contractor scope and also painting of these platform shall be in contractor normal scope.
2.34.3	During commissioning, if any approach platform required, that will be in contractor normal scope.
2.34.4	If any damage of valve and pipe is found during erection, that will be rectified by contractor on their own. if not possible by contractor, same will be rectify/replace by BHEL and cost will be deducted from contractor.
2.34.5	Commissioning of all valves after erection, shall be done by contractor on planned Basis and protocol to be made.
2.34.6	All pipeline, fittings, before erection will be cleaned by contracor with sand paper, wire brush and nd compressed air and shown to site engineer. Photograph of each and every Du of critical pipe will be made available during RA bill submission.
2.34.7	All hangers will be erected as per drawing and if any modification found that will Immediate carried by contractor,
2.34.8	If id mismatch is found between two mating parts then edge preparation will be done By Contractor as normal scope only. If any stub is to be shifted/ blanked, then it shall be done as normal scope only.
2.34.9	Sufficient NDT source shall be made available by bidder.
2.35	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The vendor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
2.36	All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineers decision regarding the correctness of the work and method of working shall be final and binding on the vendor.
2.37	The vendor shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work within his quoted rate.
2.38	The vendor shall erect and commission all the equipments as per sequence prescribed by BHEL at site. The sequence of execution, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from the vendor will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets at other places or for any reasons whatsoever.
2.39	All the necessary certificates and licenses required to carryout this work are to be arranged by the vendor expeditiously at his cost.
2.40	The vendor has to arrange within his quoted rate, loading of piping materials at stores/ storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment and required corrections, welding, radiography, levelling, cold pulling, adjusting, heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of Main equipments & auxiliaries covered under these specifications and all other activities till handing over the unit to BHEL's customer including completion of PG Test activities. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. that

	will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the vendor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL by engaging other agencies or departmentally and recoveries will be effected from contractors bill payment due either of the present contract or any other contract/work etc. towards expenditure incurred including BHEL's overhead charges.
2.41	All tools and tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables etc. required for this scope of work shall be provided by the vendor within his quoted rate.
2.42	The contractor shall make adequate security arrangements including deployment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/ equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.
2.43	All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipments without the specific permission of the engineer.
2.44	Contractor shall ensure proper housekeeping and remove all scrap materials at least once in a week from various levels of power house, working area of piping, auxiliaries around power station and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to do cleaning and remove scrap at contractor's cost and risk.
2.45	Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times. The exercise may have to be repeated till satisfactory acceptance and is treated as normal scope of vendor's scope of work within the quoted rate.
2.46	Contractor shall mobilise sufficient quantity of wooden/concrete sleepers for stacking of materials in his custody. Scaffolding materials to carry out jobs are to be arranged by the contractor within the quoted rate.
	The contractor shall weld all Thermo-wells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipments under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermo-wells, tapping point connections incorporated in the steam service shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all Thermo-wells and flow elements with branch pipes be installed and welded. Seal welding of thermo-wells, even if these are erected by other vendors in the erected system of TG vendor's scope, are to be done by the TG Contractor at no extra cost.
2.47	The contractor shall have total responsibility for all equipment and materials in his custody at contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL Engineer's instructions. The machine surfaces / finished surfaces should be greased and covered within the quoted rate.
2.48	PRESERVATION & PROTECTION OF COMPONENTS
2.48.1	At all stages of work, equipments / materials in the custody of contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents, if required for the above work shall be arranged by the contractor within the quoted rate.
2.48.2	The contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials / equipment in their custody and installed equipments from theft / fire / pilferage and any other damages and losses.
2.48.3	Contractor shall collect all scrap materials periodically from various area of work site,

	deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL / client's stores. In case of failure of contractor in compliance of this requirement, BHEL will make suitable arrangement for removing the same at contractor's risk and cost.
2.48.4	The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, empty drums, cylinders etc. shall be returned to BHEL stores/ designated place in the plant premises, by the contractor, within quoted/accepted rates.
2.48.5	The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage / excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with BHEL's standard overhead charges from the contractor. Decision of BHEL on this will be final and binding on the contractor.
2.48.6	For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL within the quoted rate at no extra cost to BHEL.
2.49	**COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES**
2.49.1	All equipments of piping and their auxiliaries are received and stacked by BHEL in closed / semi-closed sheds and open storage yard. Contractor shall take delivery of equipment and all other materials from the storage yard/stores/sheds of BHEL. He shall also make arrangements for verification of equipment, safe custody, watch and ward of equipment after it has been located and handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The vendor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators etc, shall be stored, when taken over by the vendor, in appropriate manner as per BHEL's instructions.
2.49.2	The contractor shall take delivery of the components, equipments, lubricants, chemicals, special consumables, steel etc from BHEL or NTPC stores/storage area. The contractor shall hand over all parts, materials, consumables etc. remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost with departmental charges of parts/materials used in excess or misused.
2.49.2	All material handling equipment required shall be arranged by the contractor for locating/loading at storage yard/stores, transport to site including pre-assembly area, unloading at site/working area, pre-assembly of equipments at the fabrication yard or at working area, inspection, checking and erection except for the cranes provided by BHEL for purpose specifically identified elsewhere in this tender specification.
2.49.3	The approach road for materials movement may not be smooth. Necessary earth filling, dressing of approach road, compaction of approach road, filling of sand bags, laying of steel plates, sands, minor repairs including supply of these materials are in the contractor's scope. Even if it is required to lay steel plate the same has to be done by the contractor for crane/trailer/truck etc. movement for transportation of materials/ erection activities by the contractor at no extra cost. However, required steel plates shall be issued by BHEL on free of cost and returnable basis. Required transportation of steel plates shall be arranged by contractor within quoted rates. Contractor can not claim any compensation of time or money on account of bad approach roads, in any weather conditions. Every attempts shall be made by BHEL to keep all the materials (both erectable, T&P, special tools & tackles required to be used for the purpose of erection and commissioning etc.) in fashioned manner. However, there are chances of mix up of materials as many materials shall be received from all sources viz. BHEL/ Manufacturing Units or Vendors simultaneously. In these cases, the vendor has to search /locate the materials from store/yard as the case may be. On completion of

	tracing the vendor's materials, the vendor should re-stack the balance materials as per the advise of BHEL representatives to suit BHEL's requirement. The vendor has to arrange suitable T&Ps, other means and resources as deemed necessary to meet the above requirement. The above is treated as normal scope of work with no extra cost to BHEL.
2.50	**PREPARATION OF FOUNDATION & GROUTING**
2.50.1	Buildings, foundations and other necessary civil works for supporting structures, equipments etc, will be provided by the BHEL. The checking of dimensional accuracy, axes, elevation, levels etc, with reference to bench marks of foundations and anchor bolt pits and also adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments up to 50 mm for achieving proper levels will be within the scope of work/ specification.
2.50.2	Enlargement of holes/cut outs /pockets in foundations, relocation of holes/cut outs/ pockets in foundations, making additional holes/cuts out/pockets in foundations different floors/ walls / roofs etc. in civil related areas to accommodate equipments/ piping/system for erection of pipings. etc. is included as normal scope of work at no extra cost to BHEL.
2.50.3	All minor foundations and anchor points required for installing erection equipments like winches, anchors etc. are to be cast by the contractor. Restoration of the same is also included within contractor' scope of work.
2.50.4	Grouting of all equipments under the scope of contractor is included in the scope of work/specification. Supplying of Ordinary Portland Cement, Sand, Stone Chips, pea gravels & Non-shrink, free-flowing special grout cement of required specification (like Conbextra-GP-2, special cementitious fluid grouts or equivalent as per BHEL and/or NTPC approval) including arranging the grout mixers for this purpose shall be in the regular scope of the contractor. Arranging of all supporting materials to carry out grouting activities right from starting, making scaffoldings, shuttering to curing is included in the contractor's scope of work. Mixer machines and associated materials and T&Ps to carry out grouting job is included in the contractor's scope of work .Contractor should also carry out cleaning of the foundation surfaces, pocket holes, anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods will be within the scope of this work within quoted rates. All required materials for this shall be arranged by contractor within quoted rates. The special cementitious fluid grouts material required to be used for installation of equipments..The materials to be supported by manufactures' Test & Guarantee Certificate, Certificate towards Shelf Life. During grouting, one standby mixer machine in addition to one working machine is to be arranged by contractor to take care of any unforeseen eventuality. Special care shall be taken for curing of grouts by providing old watered gunny bags or suitable arrangements round the clock. Manpower deployment for pouring water over grouts has to be retained by the contractor on round the clock basis, till successful completion of the curing, as certified by BHEL. Gunny bags shall be provided by contractor. Selection/use regarding brand/ types of cements/grouting materials and other materials shall require prior approval of BHEL/SAG/customer and should have valid test certificates. As a standard practice, the manufacturer's representatives(grout material supplier) should be made available during application of special grouting materials during each execution time and this is included in the regular scope of contractor's work at no extra cost.
3.0	**EQUIPMENTS INSTALLATION – COMMON REQUIREMENTS**
3.1	Filling of lubricants for rotating auxiliaries for purpose of oil flushing, initial fill up and subsequent topping up during operation. Contractor shall render all above services with manpower, T&P right from taking delivery of these lubricants (which will be in drums from BHEL/customer's stores) and return the empty drums to BHEL

	/customer's stores. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores. Contractor shall be responsible for any shortage of oils/consumables/other items issued by BHEL.
3.2	Contingency arrangement The contactor has to arrange for making contingency arrangement, if any, to achieve/ major milestones and for this, additional material shall be issued at free of cost by BHEL. The contractor has to do erection/commissioning activities accordingly. It may so happen that some regular erectable items are not received in time. The contractor has to make contingency arrangements with the free materials issued by BHEL as per requirement. The contingency arrangements/items are to be removed/replaced with original items received on a later date. For this, advance information shall be given to the contractor. The contractor has to return all the contingencies materials to BHEL/Customer's store. The total activities are treated as regular scope of work. No payment shall be released by BHEL in this account.
3.3	Rescheduling of milestones The activities at site will be reviewed at regular intervals and any additional resource mobilisation to reschedule the activities/milestones from time to time is included in the contractor's scope of normal work at no extra cost to BHEL. No extra payment on whatsoever account shall be entertained by BHEL
3.4	The vendor within his quoted rate has to arrange services of exclusive electricians & supervisors for carrying out electrical, C&I works during normal pre-commissioning, commissioning, trial run, handing over, stabilisation, PG Test are to be maintained by the contractor till handing over of the Unit to the customer within the quoted rate. This is included in the normal scope of work.
3.5	All works such as cleaning, levelling, aligning, hot alignment, trial assembly, dismantling of certain equipments/components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, grinding, straightening, chamfering, filling, machining, chipping, drilling, reaming, scrapping, lapping, shaping, fitting-up, drilling of holes, making dowel pins, machining of keys, minor rectification of foundation bolts/holes, machining of coupling holes, machining of hanger & support components etc. which are incidental to the erection/commissioning and any other work/activity which is necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.
3.6	Cleaning, servicing, greasing of actuators, pumps, headers, governing system, LP bypass and other valves, tanks, vessels etc. during erection and commissioning stages shall be arranged by the contractor within the quoted rate. However, gaskets / packing /special lubricants for replacement will be provided by BHEL free of cost.
3.7	All equipment shall be preserved and protected periodically before and after erection as per advice of BHEL engineer. The piping and aux. shall be thoroughly cleaned, greased/painted with preservative agents periodically as instructed by BHEL engineer.
3.8	All pipes and tube ends of piping job kept at site for erection shall be kept protected with plastic caps/steel caps or shall be closed with wooden plugs. These caps/plugs shall be provided by the contractor without any extra cost to BHEL.
3.9	The vendor has to carry out cutting of suspension materials, structures, piping etc. supplied in running lengths to suitable sizes and adjustment as required. This includes pre-assembly of spring suspension/hangers and shock absorber for the required load of piping etc.
3.10	The vendor has to make arrangement for servicing of valves, actuators including supply of lapping compounds. The contractor has to maintain a minimum stock of lapping compounds to carry out valve lapping activities within the quoted rate.
3.11	All necessary checks such as accuracy of levels, centre lines, bolt positions, hanger supports, anchor/foundation bolt hole/pit positions etc. sufficiently in advance to ensure correctness of installation of all equipments is covered in vendor's normal scope of work.

3.12	The vendor within his quoted rate has to execute trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment. Drying out arrangements for all kinds of motors including laying of cables, arranging of Engineer/electricians for completing of drying out is included in vendor's scope. Cables for HT Motors or any special cables, if required shall be issued free of cost by BHEL, if required. Motors de-couplings, greasing/servicing of equipments/re-couplings are included in the vendor's scope. Necessary number of Halogen lamps are also to be kept in stock by the contractor to take care of such kinds of activities.
3.13	The vendor has to mount instrumentation on auxiliaries which are integral part and main equipments/skids/piping/system etc. and render necessary services for their commissioning.
3.14	The vendor within his quoted rate has to carry out Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load and trial run.
3.15	All racks or assembled units like HP & LP Bypass Rack supplied from manufacturing units will be tested in BHEL / Customer stores or at site. This may require transportation, filling of oil, water etc. in these racks for carrying out testing of these racks. Defects noticed during erection, testing, commissioning, handing over of the Unit of these racks will have to be rectified by the contractor free of charges. Further, any pipeline / flanges / fittings/equipments not found assembled properly or part of the components received in damaged conditions from BHEL/Manufacturing Units, the same have to be rectified / corrected by the contractor free of charges. Grouting of these racks is included in the contractor's scope including supply of required grouting and all related materials.
3.16	Chipping of foundation, placement, levelling, erection, alignment, setting of correct orientation, cleaning during erection & pre/post commissioning, grouting, fixing of associated instruments with root valves & fittings and impulse piping for equipments, Tanks & vessels shall be treated as part of scope of work under this contract at no extra cost to BHEL.
4.0	**PIPING INSTALLATION**
4.1	The scope of work in piping system (air, water, oil, steam, gas, drains, vents etc.) will include cutting to required length, laying, edge preparation, fixing and welding of the elbows/fittings/valves/ supports/guides etc., fixing supports/ hangers /shock absorbers, etc. This will include carrying out all other activities/works to complete the erection and also carrying out all pre-commissioning/ commissioning operations mentioned in these specifications as per engineer's instructions and/or as per approved drawings. Preparation of mitre bends , TEE's & REDUCERS, if required to execute the jobs is included in the contractor's scope of work at no extra cost to BHEL.
4.2	The vendor has to carry out execution of piping as per the specifications between equipments constituting terminal points, whether the terminal equipments fall within the scope of the work / specification or not, is within the scope of the work/ specification. The contractor shall complete terminal joints at both ends for all the piping schemes covered in the specification within his quoted rate at no extra cost to BHEL. The vendor within his quoted rate will have to take piping connection and do necessary erection, commissioning etc. from the system for hooking up with the system with equipments and systems/battery limits.
4.3	The vendor has to carry out fit up and welding of piping to the terminal points (such as stubs, valves, flanges on terminal points/equipments, stubs on headers, battery limits etc) forming part of the scope of work/specification and stress relieving and radiography of joints so made are also within the scope of work. Also, where the piping connection to the terminal points involves flanged joints as well as terminal equipment matching of flanges are to be done by contractor, fixing of gaskets, bolting and tightening as per BHEL engineer's instruction is also in this scope of

	work/specifications. Permanent fasteners and gaskets will be supplied by BHEL.
4.4	The contractor within his quoted rate has to execute terminal points works of various piping schemes with customer lines and other contractor's lines. The terminal points work is inclusive of cutting of existing lines, edge preparation, welding/blanking and hook up work.
4.5	The following items of work shall be incidental and forming part of piping fabrication and erection and is treated as his vendor's scope of work at no extra cost to BHEL : (i) Matching of flanges for achieving parallelism and alignment by resorting to heat correction or other suitable methods as per instructions of BHEL engineers. To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc of suction, discharge, re-circulation and other connected piping and its supports at a number of places (ii) Increase or decrease in length of pipes supplied, including edge preparation, fit up and welding to suit site conditions. (iii) Minor adjustment like removal of ovality, correction of bends by suitable method as directed by BHEL engineer . (iv) Fabrication and erection of racks, steel supports, guides, restraints,approach platforms for all the piping including of those of system piping. Steel for this purpose will be supplied by BHEL. (v) Erection of flow switches, steam traps, filters, flow meters flow nozzles, other metering elements, flow orifices, flow indicators, valves and other instrumentation fittings supplied either by BHEL or their customer and forming part of the system. This may involve cutting of pipe lines, fresh edge preparation and welding with stress relieving. (vi) Fabrication / making of bends for pipes and tubes of diameter up to Nb 100mm (4") with Elctro-Hydraulic Pipe bending machine. Making of bends by heating/ filling sand, cold bending is not allowed. (vii) Matching of all fittings like tees, bends, flanges, reducers valves, socket fittings, etc with pipes for welding. This may involve weld build up, edge preparation, etc. (viii) Servicing including revisioning of equipment ,valves and fittings. (ix) Cleaning of all pipes by wire brushing and blowing by compressed air or by any other suitable method as suggested by BHEL. (x) Removal of welding slag and burrs by hand files, with brushes and/or flexible grinders. (xi) Welding of root valves with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles/orifices/metering elements fixed on piping. (xii) Welding of supports/guides/restraints as per specifications/drawings or as per directives of BHEL Engineer, to pipes using HP welders. (xiii) Welding of blanks with stress relieving as required on permanent and temporary basis. (xiv) CW Pipes in the puddle flange area may be supplied in excess length. To suit fitting of the adjoining pipes/equipment, the vendor has to carry out suitable cutting of pipes, edge preparation, fit up etc and suitable method necessary to weld, bolting etc. within his quoted rate treating it as normal scope of work. (xv) Breaking of floor and wall with jack hammer is in Contractor scope if opening is not available. (xvi) Approach platform of all valves if required are in Contractor scope including fabrication and also painting of these platform shall be in contractor normal scope. During commissioning, if any approach platform required, that will be in contractor normal scope.

	(xvii) If any damage of valve and pipe is found during erection, that will be rectified by contractor on their own. if not possible by contractor, same will be rectify/replace by BHEL and cost will be deducted from contractor. (xviii) Commissioning of all valves after erection, shall be done by contractor on planned Basis and protocol to be made. (xix) All pipeline, fittings, before erection will be cleaned by contracor with sand paper ,wire brush and compressed air and shown to site engineer. Photograph of each and every DU of critical pipe will be made available during RA bill submission. (xx) All hangers will be erected as per drawing and if any modification found that will be immediately carried by contractor. (xxi) If id mismatch is found between two mating parts then edge preparation will be done by contractor as normal scope only. If any stub is to be shifted/ blanked, then it shall be done as normal scope only. (xxii) Sufficient NDT source shall be made available by bidder
4.6	On all steam, oil, instrument, gas, air piping etc. both TIG welding and subsequent arc welding or total TIG welding process is to be adopted as instructed by BHEL engineer. BHEL's decision shall be final and will be binding on the contractor. The welding electrodes/ filler wires as received from the Manufacturing Units of BHEL shall be issued to the contractor free of cost. Requirement of any additional welding electrodes/ filler wires beyond supply of BHEL manufacturing units shall be arranged by contractor at their cost.
4.7	Pipes/tubes, which are supplied in random length, may not be in usual standard lengths. Contractor shall cut/join /dress up the pipe pieces to suit the site requirement.
4.8	Pipelines of oil, air, steam and water of less than Nb 100 mm will be field routed as per schemes or as per the instructions of BHEL engineer, and will be supplied in random lengths / running lengths. The contractor shall have to lay the piping according to instructions at sites, after carrying out the necessary bending, fabrication, edge preparation, routing etc. In best professional manner and as per instructions. The supports for field routed piping will be fabricated and erected by the contractor as per the requirement of the work. The steel required for the supports will be provided by BHEL free of cost.
4.9	Contractor shall use only bolted clamps for achieving alignment of piping. Suitable fixtures are to be prepared for the purpose.
4.10	All weld joints including cleat welding/spots on piping shall be ground / filed / dressed on completion of welding and before radiography as per instructions BHEL engineer. .
4.11	Contractor shall erect piping by doing pre-assembly on ground if possible at the first instant. The pipe laying shall be carried out from the available terminal point/points or any other area between the terminal points. The erection can be carried out on temporary supports to obtain proper alignment and welding. After fixing the permanent supports, all the temporary supports shall be removed. The alignment, distances and loading of the supports shall be checked and the required spring compression achieved in the case of spring hangers.
4.12	Contractor shall carryout edge preparations for welds joints / piping / pressure parts in accordance with BHEL drawings/BHEL standards/BHEL engineer's instruction. Flame cutting of piping and high pressure parts shall be strictly done as per BHEL engineer's instructions and in his presence only.
4.13	Certain rerouting of pipelines may come as revision to suit design variation and the vendor has to execute the erection of the pipelines as desired by BHEL as per the

	latest requirement , revision of Drawings. This is treated as normal scope of work of the vendor at no extra cost to BHEL.
4.14	The following jobs are also to be performed on the pipings in the following fashion: (a) All drains / vents / relief / escapes / safety valve piping to various tanks/ sewage / drain canal / flash box / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by contractor is completely covered in the scope of this tender. The vent/drain/escape lines are to be terminated to suitable headers with funnel arrangement at different floors and subsequently to be extended to drains outside TG floor at suitable locations as decided by the customer/BHEL. The vendor has to make headers , funnels and other related arrangement as required necessary by BHEL to complete the job. For this necessary pipe and other materials required to carry out such types of jobs, shall be arranged by BHEL at free of cost. This is included in the scope of contractor's work at no extra work to BHEL. (b)Normally, all the weld neck valves, fittings etc. will be supplied with edges prepared. However, wherever required, in some cases, contractor will have to prepare edges at no extra cost. ©CEP suction line from condenser hotwell to individual CEPs with all suction strainers, valves ,hanger/supports and other items are included in the contractor's scope of work. (d) The vendor has to perform inspection and cutting of pipeleines, dynamic separator cutting and rewelding as per requirement of BHEL.
4.15	Tentative number of joints to be welded is furnished below for information: 1. SA335/P-91 PIPING : 1055 nos (approx.)incl drain/vents 2. ALLOY/P-22/CARBON STEEL PIPING : 4800 nos. (approx.)incl small bore joints Details of piping joints are also furnished in the attached EWS(erection welding schedule).These details are furnished for tendering purpose only. However, the bidder shall visit site of work for first hand information and BHEL shall not make any additional payment for variation of the piping joints to any extent.
5.0	**HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS**
5.1	Contractor shall carry out the following tests required to complete the erection and commissioning ,trial run , PG Test ,handing over activity of the unit : (1) Hydraulic testing of individual equipments like pipes, valves etc. Required capacity Hydraulic test pump/Fill pump and other necessary arrangement shall be provided by contractor to carry out hydraulic testing of the equipments and piping as part of scope of work under this tender specification. (2) Ultrasonic test (3) Dye Penetrant test (4) Magnetic Particle Test./ PMI (2 sets of PMI machine shall be maintained at site by the vendor within their normal scope of work) (5) Radiographic Testing (6) Any other NDTs as required to carry out above jobs and deemed necessary All above facilities (men, materials, equipments, consumables etc) with operating engineer/experienced person and proper approach wherever required shall be provided by the contractor for satisfactory completion of the above tests. Any re-work for restoration of defective joints/components including arrangement for re-NDT have to be arranged by the vendor within his quoted rate at no extra cost. In case, certain NDTs are required to be carried out additionally as per requirement of BHEL on later date , the same has to be carried out by the vendor at no extra cost to BHEL.
5.2	Contractor shall lay all necessary temporary piping, install pumps, valves, pressure gauges, electric cables and switches/ panels etc, required for the hydro test/ flushing activities. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting hydraulic test/ flushing will be

	done by the contractor. No separate payment shall be made for this purpose.
5.3	All the above tests shall be repeated till all the equipments, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.
5.4	Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting /drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work. Required valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided by BHEL. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.
5.5	Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.
5.6	While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions , blanks/spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and some –times piping of other agencies may have to be combined. Contractor shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Contractor shall carryout the same as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on the contractor. The contractor shall carry out any other tests as desired by BHEL engineers on erected equipment covered in the scope of this contract during testing and commissioning to demonstrate the satisfactory completion of any part or whole of work performed by the contractor.
6.0	**PRE-COMMISSIONING TESTS, COMMISSIONING AND POST COMMISSIONING**
6.1	Commissioning scope of the contractor of piping and auxiliaries shall involve the following tests and activities of the equipments erected : (a) Hydraulic Test of pipelines, closed systems, Tanks and Vessels. (b) Flushing of all pipelines by air/oil/water/steam as the case may be. (c) Servicing of all valves /actuators and fittings. (d) Providing continuous manpower for pre-commissioning, testing, commissioning of electrical items by engaging electrician(at least two numbers) and Supervisor as per the requirement on normal days including OT hours on normal working days/Sundays/Holidays. (e) Mechanical seal repair/replacement of pumps. (f) Manual/mechanical cleaning of miscellaneous vessels, Cleaning of oil/ water filters, PHEs, Oil and other Coolers of piping and Aux., This may have to be repeated several times during the erection/commissioning process till handing over of the Unit to customer. Necessary CAF gaskets (including metallic steam gaskets) and other resources are to be arranged by the contractor which may be required are within his quoted rate. BHEL will arrange only special gaskets. Purchase of all CAF/ Asbestos free gaskets for oil water and steam lines is in vendor scope without any additional cost implication to BHEL. (g) Steam Blowing, alkali flushing/water flushing, washing, air blowing, Chemical cleaning of piping systems. (h) Commissioning of all other packages under scope of supply. (i) Preparation of commissioning documentation , log sheets, multiplication, photocopies , spiral binding of total volumes of protocols/log sheets for at least six sets. Total computerisation is to be done by the contractor. (j) Carrying out Pre-Commissioning ,Commissioning activities ,Rolling and synchronisation , handing over of the respective 660 MW Unit with all Auxiliaries. (k) Attending to all defect /punch/stabilisation points for Unit. (l) Full load operation for Unit.

	(m) Trial operation for individual equipments and for Unit as a whole for 720 hours. (n) PG Test and submission of total documentation after multiplication and spiral binding for Unit . The above activities/tests/trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements for Unit.
6.2	Contractor shall lay temporary pipelines with fittings and accessories etc. as instructed by BHEL engineer for the purpose of pre-commissioning and commissioning activities like Hydraulic testing, chemical cleaning, oil flushing, steam blowing ,other activities etc. of equipment , piping , system and other equipments as part of the scope of work. Temporary installations shall be dismantled by contractor and returned to BHEL stores as specified elsewhere in this Technical Specifications.
6.3	The contractor shall carry out necessary jobs for total commissioning jobs including mechanical , electrical and instrumentation and other jobs to the satisfaction of our ultimate customer .Necessary manpower has to be arranged by the vendor within the quoted rate.
6.4	The contractor shall carry out any other test as desired by BHEL engineer on erected equipments covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by the contractor
6.5	In case any malfunctioning and / or defect is found during tests/ trial runs such as loose components, undue noise or vibrations, bearing temperature rise, any kind of leakages or passing etc. strain on connected equipments etc. The contractor shall immediately attend to these defects/malfunctioning and take necessary corrective measures. If any readjustments, realignments, re-erection and re-works are necessary to attend such problems, till handing over of unit to customer , the same shall be done as per BHEL engineer's instructions, free of cost, treating it as normal scope of work at no extra cost to BHEL for the Unit .
6.6	Cleaning of vessels /oil tank/Other equipments by sand blasting or other methods as per instructions of BHEL engineer , before/after oil flushing and other cleaning is responsibility of contractor.
6.7	The contractor shall execute necessary jobs for initial and subsequent fillings of gas in generator gas system as and when required for the Unit , till the Unit is handed over to Customer at no extra cost to BHEL.
6.8	The contractor shall carry out air tightness test on generator gas cooling system and water flushing of primary water system to the satisfaction of BHEL engineer. Necessary fixtures for Air tightness test and other tests including supplying of Mercury is included in the contractor's scope. This exercise may have to be repeated as per the requirement of BHEL/Customer without any additional cost.
6.9	Replacing/changing mechanical/other seals, changing and cleaning of all kinds of filters/strainers, lub oil optimisation of equipment, pumps, piping and other auxiliaries under the scope etc. during commissioning stage is within the scope of work. This exercise may have to be repeated as per the requirement at no extra cost. Similarly necessary assistance for facilitating opening of piping and aux as reqd may have to be repeated till handing over of the set to customer. The contractor has to arrange calibration of instruments within the quoted rate.
6.10	During this period, though BHEL's and customer's engineers will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the commissioned Unit is taken over by the customer.
6.11	In case any malfunctioning and/or defects are found during tests, trial run such as loose component, undue noise or vibration, bearing temperature rise problem, strain on connected equipment, any kind of leakages etc., The contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment, realignment or rework for rectification is necessary, same shall be done as per BHEL engineer's instruction. This is included

	in the normal scope of work at no extra work.
6.12	Contractor shall cut open works/ equipments/ piping/ system if needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over, without any extra payment. Servicing and preservation of valves/ actuators and other requirements right from receipt from BHEL Store till handing over of 660 MW Unit including arrangements of lapping pastes and other consumables are included in the vendor's scope.
6.13	During pre-commissioning & commissioning time, it shall be the responsibility of contractor to provide following manpower along with Engineers/Supervisors as part of commissioning jobs till handing over of the set to the customer for the 660 MW Unit. Manpower module strength(minimum) 1) Supervisor 1 Nos. 2) Pipe fitter/Millwright fitter 2 Nos. 3) welder 2 Nos. 4) Rigger 2 Nos. 5) Electrician/instrument technician 2 Nos. each 6) unskilled worker 6 Nos.
6.14	The above figures shows only minimum required, over and above labour required for completing regular and pending erection and commissioning works and clearing of punch lists. Contractor has to provide number of personnel and other resources as per work demand.
6.15	It shall be specifically noted that above employees of the contractor has to work round the clock along with BHEL commissioning engineers during normal working hours and OT hours including working on normal days, Sundays, holidays. The contractor has to make necessary adjustment accordingly at no extra cost to BHEL.
6.16	During commissioning, opening of valves/actuators, changing of gaskets, checking, realigning of rotating and other equipment, cleaning of all kinds of filters/strainers, filling /topping up of oils, fluids, filling/purging of gases , attending to leakages in piping, tanks etc. and adjustments of erected equipment may arise. Valves /actuators /equipments/systems shall be repaired/serviced/tuned/readjusted and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL engineer's instructions. This is treated as normal scope of work of vendor at no extra cost to BHEL. Arranging petrol, CTC, rubber hoses of different sizes as per requirement gaskets and other standard consumables for opening / cleaning of condenser, deaerator / Feed storage Tank, strainers/filters, coolers, drain pits & other items are included in the contractor's scope at no extra cost till handing over of the Unit to the Customer .
6.17	It is the responsibility of the contractor to provide for necessary resources till the completion of work under these specification, even in case erection, testing and commissioning of the TG and other equipments are delayed due to reasons not attributable to the contractor.
7.0	**WELDING AND HEAT TREATMENT**
7.1	All electrodes and filler wires shall be procured by the Contractor within the included scope of work. All electrode/filler wire supplied by BHEL/Manufacturing Unit shall be issued free of cost by BHEL. The contractor has to maintain proper accountability of the electrode/filler wires issued by BHEL.
7.2	The selection and use of electrodes will be as per the standards and specifications of BHEL. The vendor should take prior approval from BHEL accordingly.
7.3	Contractor should purchase the electrodes as per the recommendations of BHEL engineer, welding manual, welding schedule and other relevant documents. The electrodes shall be purchased only from BHEL approved manufacturers.
7.4	The purchase of electrodes shall be accompanied by proper test certificates and these certificates should be submitted regularly for the scrutiny of BHEL engineer.
7.5	All electrodes shall be stored in a clean dry area. The storage room shall be of permanent nature and damp proof, and the room shall be exclusively meant for

	storage of welding electrodes and filler wires. Excepting for a vent in the top, it is not preferred to have any other opening like windows or ventilators. The temperature inside the room has to be kept in the range of 8-100 c above atmospheric temperature and humidity should be less than 50%. This is to be accomplished by using electric heaters or infra red lamps. The storage room must be provided with hygrometer and thermometer. Temperature and humidity are to be monitored regularly. 15-20 holders, welding cables, connecting cables to equipments and other welding accessories including temporary electrical connection from construction power point to individual equipment like winches, hoisting equipment, welding generators, transformers, heat treatment equipment and other construction equipment shall be arranged by contractor.
7.6	All racks and other items used for storage of electrodes shall be of steel and not of wood.
7.7	All electrodes soon after purchase shall be offered for inspection to the BHEL engineer. Contractor shall be strictly prohibited from using electrodes not inspected/approved by BHEL engineer. All related portable baking ovens for storing/maintaining required temp. range for welding electrodes with proper validity certificates of ovens in adequate quantities are to be maintained by the vendor till completion of the work.
7.8	All welding consumables shall be issued to the welders only by authorised person who is controlled by contractor's welding engineer. The necessary baking requirements are to be ensured by Contractor's welding engineer.
7.9	All welders shall be tested and approved by BHEL engineer/customer before they are actually engaged on work though they may possess the requisite certificate. BHEL reserves the right to reject any welder without assigning any reasons. Statutory requirements like IBR approval for welders are to be complied with before starting of the work. If required, the welders may have to undergo Procedure Qualification test also. The decision of BHEL Engineer will be final in this regard.
7.10	All charges for testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by the contractor including supply of test plates for testing of welders. The materials for testing of welders like plates, pipes both for IBR/Non-IBR welders including making fixtures & payment of statutory charges are included in the scope of work at no extra cost.
7.11	BHEL engineer is entitled to stop any welder from his work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which, in the opinion of BHEL engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The fact that the welders have passed the test, does not relieve the contractor from his contractual obligations to check the performance of the welders. Contractor shall submit a monthly performance record of all welders.
7.12	All welded joints shall be subject to acceptance by BHEL engineer whose decision will be final and binding.
7.13	Pre-heating and stress relieving before and after welding are part of erection work and shall be performed by the contractor in accordance with instructions of BHEL engineer. Contractor has to arrange for the recorders along with accessories and suitable technicians for heat treatment purpose. The temperature recorders and thermocouples shall be duly calibrated. During preheat and stress relieving operations the temperature shall be measured as per the instructions of BHEL engineers by thermocouples and recorded graphs for the heat treatment works carried out shall be the property of BHEL.
7.14	For the purpose of stress relieving, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations are as per the standards of BHEL. Thermocouples have to be attached using battery operated portable thermocouple attachment unit and not by manual arc welding. Contractor shall arrange sufficient number of thermocouple attachment units.
7.15	Wherever necessary, contractor should provide temperature indicator/temperature

	recorder as required by BHEL engineer for measuring preheat temperature for welding or for controlling temperature of metal for hot correction etc. Decision of BHEL engineer on method and of checking preheat temperature or controlling temperature for hot correction and welding shall be final and binding on contractor.
7.16	Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The contractor shall make all necessary arrangements including labour required for the same as per directions of BHEL.
7.17	Heat treatment requirements shall be as per the Welding Schedules of BHEL /Applicable codes /Other documents etc.
7.18	For weld joints of vessels, equipments, heavy structural items like beams, I-sections, if heat treatment is required, the same shall be carried out as part of the work by the vendor within his quoted rate.
7.19	Checking effectiveness of stress relieving by hardness tests (either by Poldi Hardness Tester or other approved test methods as per BHEL engineer's instruction) including necessary testing equipments is within the scope of the work/specification of the vendor.
7.20	TIG welding process is to be used for all root pass welds in pipes. Subsequent welding after root pass can be carried out by manual metal arc welding with basic coated electrodes. For the pipe of thickness less than 6mm, the entire welding has to be carried out by TIG welding. However, BHEL site engineer will have the option of changing the method adopted. For manual arc welding shall be done as per weaving technique and the width of weaving shall not exceed 1.5 times of the dia of the electrodes.
7.21	Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensions and with respect to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage shall depend on piping system as specified by BHEL engineer.
7.22	Joint fit up will be a stage for inspection.
7.23	All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.
7.24	RADIOGRAPHY
7.24.1	Radiographic inspection of welds shall be arranged by the contractor including all consumables like isotope camera, x-ray film, chemicals etc. Scaffolding and approaches for taking radiographs. The necessary RT (LEVEL-2)skilled technician and labourers for taking the radiographs shall be provided by the contractor. While taking radiographs, the contractor has to use proper penetrameter/ image quality indicators as instructed by the BHEL engineer. All the processed and accepted films will be the property of BHEL. In this regard, the contractor has to adhere to the safety rules/regulations laid by BARC authorities from time to time. It may please be noted that invariably the radiographic work will be carried after the normal working hours.
7.24.2	Contractor shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/IBR/code/drawings requirement. The defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance/rejection of the joints will be final and binding on the contractor.
7.24.3	Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-shots submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if defect persists after first repair, as per radiograph, carrying out repairs and radiography shall be repeated till joint is made acceptable in case, the joint is not repairable, the same shall have to be cut and repaired at contractor's cost. Decision of BHEL engineer in all these matters is final and binding on the contractor.

7.24.4	100% radiography of weld joints of certain piping have to be carried out as per BHEL standards/drawings/specification
7.24.5	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. Necessary trained personnel shall be deployed for this purpose. Conductance of all kinds of NDTs are in contractor's scope including arrangement of support of manpower, consumables and all incidental charges are included as contractor's scope of work.
7.25	CHEMICAL CLEANING/ACID CLEANING / ALKALI FLUSHING / STEAM BLOWING / OIL FLUSHING / OTHER BLOWING AND OTHER CLEANING ETC.
7.25.1	Contractor shall lay temporary pipelines with fittings and accessories and also erect/commission pumps after servicing as per requirements (including motors, its temporary cabling and panel works as per site requirement), tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing etc. of piping and other equipments which are within the scope of work and also systems in which equipments and piping erected by contractor form a part of the scope of work. It shall be specifically noted by the contractor that all pipes for above works shall be supplied in random length and in loose condition. Contractor has to assemble and erect them as per schemes / drawings provided by BHEL. Further, flanges , bend etc. for completing the scheme shall be machined/ fabricated by the contractor at his own cost . However, plates / steel etc. for the same will be provided by BHEL free of charges.
7.25.2	After the chemical cleaning has been successfully completed, dismantling of all temporary installations as instructed by BHEL is within the scope of work under this specification. The dismantled materials shall be dressed and returned to BHEL as stated elsewhere in this tender specs.
7.25.3	Preservation of the cleaned surfaces will be the responsibility of contractor under the guidance of BHEL engineer.
7.25.4	Hydraulic test of temporary piping is to be carried out as per the instructions of BHEL Engineer. Carrying out repairs, if any, is in the scope of work/specification.
7.25.5	For chemical cleaning of the piping system, contractor will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected is in the scope of contractor or not. Decision of BHEL Engineer in this regard will be final and binding on the contractor.
7.25.6	During the initial stages of work, trenches for draining water may not be available after alkali flushing or mass flushing for discharging and emptying. Necessary low point drains and temporary piping for this will have to be provided by contractor from materials provided by BHEL treating it as normal scope of work.
7.25.7	Laying effluent discharge line from mixing tank (for acid cleaning or any other chemical cleaning process) as per the instructions of BHEL engineer and dismantling, servicing for preservation and handing over the same to BHEL stores after completion of the job is within the scope of work/specification.
7.25.8	Radiographic examination of weld joints on temporary pipes as required by the Engineer In-charge of BHEL should be carried out as a part of normal scope o work.
7.25.9	Contractor shall also carry out the repairs or attend leaks etc., in the temporary piping and equipments for the above operations / activities while carrying out the above activities / operations.
7.25.10	For chemical cleaning of system which consist of equipment/piping erected by the contractor and also equipment/piping erected by other contractors of BHEL/customer's contractor has to arrange for workers and supervisory staff as required supplementing/complimenting the labour and supervisory staff mobilised by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decisions on the strength of gangs and supervisory

	staff for deployment of labour and allocation of work for them at site, by BHEL engineer is final and binding on the contractor.
7.25.11	Contractors quoted rate shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipments and valves and handing over to BHEL.
7.25.12	After carrying out chemical cleaning ,acid cleaning/pickling ,hot water flushing, other methods as applicable for control/lubricating and other system(including oil piping, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems as per instructions of BHEL Engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machineries, cooler etc. before and after oil flushing is the responsibility of the contractor
7.25.13	For full welding of structures, tanks and piping etc., only welding generators shall be used. The use of welding transformers will be subject to the approval of BHEL Engineer.
8.0	**ELECTRICAL AND INSTRUMENTATION**
8.1	Contractor shall mount all flow indicators, centrifugal/speed switches of motors, accumulators, pressure regulators, etc which are received loose and which are to be erected/mounted at site on air lines, water lines, oil lines, steam lines, auxiliaries and firemen floor and other operating floors on boiler/power house and other equipments. These are to be mounted during erection for finalising routing/position etc. They are to be dismantled after completion of erection work and handed over to BHEL for calibration. After calibration, these instruments shall be remounted by the contractor in their respective positions just before commissioning.
8.2	Certain instrumentation like, pressure gauges, power cylinders, flow meters, valve actuators, flow indicators, etc are received in assembled condition as integral part of equipments. Contractor shall dismantle such equipment at an appropriate stage under the instruction of BHEL and hand them over to BHEL for calibration and storage. Contractor shall re-erect them in position just before commissioning of the equipment. Commissioning of the actuator is excluded from the scope of work.
8.3	Seal welding of Thermowells, plugs before Hydrotest of equipments and piping systems is also within the scope of this work/specification. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld Thermowells after Hydrotest/steam blowing of lines.
8.4	Welding of all Thermowells, draft, pressure and temperature instrumentation points, and all other instrumentation points on piping, and auxiliaries is within the scope of this work.
8.5	All the HT Motors shall be preserved with space heaters on, and provided with proper cover till the commissioning of the motors.
8.6	All cabling and cable trays erection works for the valve actuators/ instruments installed in the connected pipelines shall be in vendor's scope. This shall be done as normal scope of work and for this no separate payment shall be made. Contractor's quoted rate shall be deemed to be inclusive of this requirement.
9.0	**GENERAL**
9.1	During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer, at no extra cost to BHEL. Approach platforms for access to valves/equipments/systems which are not regular in nature are included in the contractor's scope of work at no extra cost to BHEL. Necessary materials shall be issued at free of cost by BHEL. Some of the Equipments/Electrical panels received will require site painting and this is included in regular scope of work including supplying ,application and arrangement of paints, primers, thinners etc. at no extra cost to BHEL. Approach platforms for following areas are to be done by the contractor : a. Miscellaneous valves & equipment approach platforms

	b. HP LP bypass approach platforms c. Flash tank supporting platforms The layout/GA drawings for these areas shall be provided by BHEL.The contractor shall engage a detailer agency for preparation of fabrication drawing,cutting plan etc. These drawings shall be approved by BHEL Engineer and the work shall be done accordingly.
9.2	Erection and welding of stainless steel pipes, fittings, valves and other items has to be done by the contractor including supply of necessary stainless steel welding electrodes and is within contractor's scope of the work/specification.
9.3	No temporary supports should be welded on to the piping. No temporary shed/office with wooden materials are allowed inside the Premises.
9.4	Contractor shall carry out preservation painting on all items taken from stores. The preservation painting has to be carried out on material taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer and the portion of items or the complete items needing painting shall be carried out to the satisfaction of BHEL engineer. This facility shall be provided by the contractor till the commissioning and handing over of the equipment to the customer. Preservative and touch up painting on equipments covered under this specification stored at stores/storage yard shall also be carried out by the contractor at no extra cost.
9.5	Adjustment of spring hangers for piping shall be done by the contractor during initial erection. After initial commissioning trials, it is possible that the spring hangers have to be adjusted repeatedly till the correct spring compression is achieved. Contractor shall do the same to the satisfaction of BHEL engineer. The marking of cold and hot positions on the hangers shall be done by the contractor. Necessary arrangements for scaffoldings etc. are to be arranged as per the requirement and may have to be repeated upto the satisfaction of BHEL/Customer. This is treated as normal scope of vendor's work without any coat implications.
9.6	The contractor shall return to BHEL the excess materials left over after completion of work, materials issued for temporary pipelines for HT, chemical cleaning, oil drums, containers, packing materials, flushing, blowing etc. and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge preparation (vee), painting etc. to the condition similar to the one at the time of issue shall be in scope of work.
9.7	All kinds of NDTs as per documents/drawings/standards are included in contractor's scope of work within his quoted rate at no extra cost to BHEL.
10.0	**PG TEST**
10.1	Providing services for preparation for performance guarantee test of equipment /systems is in the scope of this contract.
10.2	Providing assistance during conductance of performance guarantee test.
10.3	The scope in general shall include : - Installation and welding all tapping points for fixing of sensors / pr-temp. gauges / thermo-couples / RTDs etc. including laying of connecting wires, impulse pipes, valves fittings etc. - - Laying/ installation of all impulse piping - Providing assistance in calibration test of equipment's as may be required. - Replacement of regular flow nozzles/orifices with PG test flow nozzles/orifices and restoring back regular ones after PG test.

	- Normalization after PG test (removal of impulse pipings, instruments, thermowell, datalogger, temporary fixtures etc.). - Receipt of all test equipment, appliances etc. its safe handling & storage transportation to site & storage at site. - Manpower assistance for laying of PG Test cables after receiving. - Dismantling of various PG test instruments/appliances/devices etc. re-placing in their original cases after re-calibration & handling over to BHEL. - Re-packing of instruments. - Removal/restoration of insulation/sheeting for PG test - Complete restoration of all PG test locations after the test - Condenser tube cleaning with high pressure jet or suitable method & attending of passing valves of the system for PG test if required. - Attending to passing valves and Cleaning of passing valves. - NOTE : The above tests and guidelines mentioned are only to give a brief idea of the type of work involved at site and does not constitute the total scope of work.
11.0	**WELD FIT-UP AND WELD JOINT PROTECTIVE PAINT, COMPONENT PRESERVATIVE PAINTING, & FINAL PAINTING ETC.**
11.1	All protective paints for the protection of weld joint fit-ups, application of primers on finished weld joints are in the scope of contractor. 1) Two coats of steam washable paints shall be applied on steam side of LP turbine and condenser components, as advised by BHEL. The steam washable paints, primer and thinner will be arranged by the vendor and, arrangements for surface preparation and paint application like sand/shot-blasting, consumables like surface cleaning agents, paint brush, brush cleanser, labour and necessary tools and plants are in the scope of contractor. 2) All site weld joints falling in steam side shall be painted with two coats of steam washable paint to be arranged by the vendor. 3) The water boxes shall be sandblasted to remove all traces of primer applied at the works. Thereafter two coats of Epoxide priming paint followed by two/three coats of high build black coal tar epoxy (e.g., “Apcodur CP684” of Asian Paints or equivalent paints from any other BHEL/NTPC approved manufacturer with applicable drawings/documents). Contractor shall submit manufacturer’s batch test certificate / test certificate from BHEL/Customer approved laboratory for the primers and paints. Prior approval of BHEL/Customer for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing/approved by the customer, number of coats may be applied and method of application shall be as recommended by the paint manufacturer. Required paints & primers and other consumables with other resources shall be arranged by Contractor within their quoted rate . 4) All water side surfaces of water chambers including tube plate shall be thoroughly surface prepared and painted. Required primer & paints and other consumables for condenser water box and tube plates shall be provided by Contractor within the quoted rate. 5) Preservation of all components/equipments during various stages of erection, commissioning till handing over is in the contractor’s scope. All prescribed methods of surface cleaning prior to application of preservative paint shall be followed by the contractor. Contractor has to arrange all primer and paints, and other

	consumables like wire brush, painting brush required for this work. 6) Final painting of both the Unit 1 & 2 :The scope shall include supply and application of Primer, final paints as required and specified for the components of Turbine, Generator, Condenser and auxiliaries, Pumps packages, equipment, systems, pipings etc within the quoted rate. Arrow marking with nomenclature in English/Hindi or in both languages on the erected system are also included in the scope of work. Even painting with bands and arrows with heat resistant paints in high temperature application zones with arrow and nomenclatures are also included in the scope. The contractor has to arrange required thinner, paints (primer as well as finish paints) and all other supporting materials with resources within quoted rates, as normal scope of work. Regarding selection of brands, types of paints and related items, the contractor has to take prior approval of BHEL/Customer. The contractor has to apply painting as per applicable code/ instruction of BHEL/Customer to achieve required thickness. The contractor has to arrange one calibrated "coat-meter" for thickness measuring/ checking. 7) The total activity of painting including arrangements of all materials, manpower and accessories to carry out paintings plus making scaffolding as per requirement is included in the contractor's scope of work. Before arranging all kinds of materials about paints, the contractor has to take prior approval from BHEL/Customer regarding grade/supplier. Valid test certificate also has to be arranged for this purpose by the vendor.
12.0	**PRIMERS & PAINTS**
12.1	The vendor will provide paint & primer for finish paintings of total area of applications.within the quoted rate. Painting is to be done as per BHEL/customer's instruction/applicable code/drawings/documents in both the Unit 1 & 2. Required thickness is to be achieved as per customer's requirement. Painting thickness measuring instruments is to be arranged by the contractor within quoted rate. The paint shall be sourced from BHEL/NTPC approved manufacturers/suppliers.
13.0	**WELDING ELECTRODES, FILLER WIRES FOR TIG WELDING AND GASES**
13.1	All welding consumables including electrodes/SS Electrodes/filler wires is in the contractors scope. Any TIG/Filler wire supplied by BHEL Manufacturing Unit for use in piping area, shall be issued free of cost by BHEL. In case the scope of work is not completed by BHEL supplied filler wires/ electrodes, then balance quantity is to be arranged by bidders at their cost.
13.2	All the required welding electrodes as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL , before procurement, regarding manufacturer, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables. BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type / brand etc.
13.3	The contractor shall provide all consumables required for carrying out the work covered under this scope of work including TIG/Filler wires for welding of piping joints.
13.4	All the required gases like Argon, Oxygen, Acetylene etc including required high purity Nitrogen gas (for purging of Generator stator water system) shall be arranged by the contractor at his cost.
14.0	**EXCLUSIONS**
14.1	The following are specific exclusions from the scope of work/specification :- A) Civil works to the extent not specifically provided for in this tender (however minor chipping, breaking of brick walls/ making opening in the floors/ walls etc. are included in bidder's scope).

	B) Supply of materials for temporary piping (pipe, valve etc.) required for Hydraulic Test, chemical cleaning, flushing or water /steam/air blowing of the pipelines. C) Supply of chemicals and lube oil etc. during pre-commissioning and commissioning activities/operation.
15.0	**OBLIGATIONS OF THE CONTRACTOR(TOOLS,TACKLES,CONSUMABLES ETC.)**
15.1	TOOLS AND TACKLES, MEASURING AND MONITORING DEVICES:
15.1.1	The contractor shall provide all T&Ps as per Appendix-V(excepting those in BHEL scope as mentioned specifically) required tools and plants, monitoring and measuring devices (MMD) and handling & transportation equipments for the scope of work covered under these specifications. The contractor has to arrange for regular statutory /fitness certificates arranged for his own T&Ps, MMDs from appropriate/statutory authorities for contractor's own T&Ps, MMDs at regular intervals within their quoted rate.
15.1.2	Contractor shall provide suitable cranes as per their scope of T&Ps (refer Appendix-V) for material handling at BHEL/client's stores/storage yard as well as site of work. However, services on sharing basis of EOT crane, High capacity crane as per availability for the purposes identified in 'Appendix-IV' will be available as and when these T&Ps are spareable / available at the discretion of BHEL. No excuse for non-availability of BHEL's free issue of T&Ps in time, shall be accepted by BHEL for delay in achieving targets. The vendor has to arrange necessary resources for achieving targets in case BHEL reschedule the allotment of free issue of T&Ps as per availability.
15.1.3	For free issue of cranes by BHEL on sharing basis , Required fuel and consumables for the Crane will be provided by BHEL free of cost. Crane operator (along with helper, if any) will be provided by BHEL on free of cost basis. The day to day and routine maintenance of BHEL equipment will be carried out by BHEL. Replacement /repair of gasket, hoses, oil seals and any other items required will be provided by BHEL However, the contractor has to carry out necessary 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. No payment on whatsoever account for this job shall be entertained by BHEL. Cranes for shortening and extending of booms will be provided by BHEL as per availability.
15.1.4	Contractor has to arrange slings of all sizes for completing the works covered under these specifications except the special slings which will be provided by BHEL free of charges on returnable basis. 660 MW Generator stator lifting sling shall be provided by the contractor for handling the generator stator without any extra cost..
15.1.5	All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification, fitness for use, validity, calibration etc.
15.1.6	Timely deployment of adequate quantity of T & P is the responsibility of the contractor. The contractor shall be prepared to augment the T & Ps at short notice to match the planned programme and to achieve the milestones.
15.1.7	All jack bolts that are required during erection for carrying out roll-check etc. will have to be arranged by the contractor. No jack bolts will be provided by BHEL.
15.1.8	Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.
15.1.9	In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternative arrangement at the risk and cost of the contractor. Necessary scaffolding materials of steel pipes and pipe clamps, planks, G.I. Sheets

	and other related materials for working at height/inside enclosed space are to be arranged by the contractor within the quoted rate. Total scaffolding materials for platform etc. are to be provided by the contractor within the quoted rate.
15.1.10	The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. Contractor shall obtain prior approval of BHEL for all the T&P before deploying in actual work. The movement of cranes, and other equipment should be such that no damage / breakage occurs to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.
15.1.11	Normally, use of welding generators only is permitted for welding. The use of welding transformers will be subject to prior approval of BHEL.
15.1.12	The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of Measuring & Monitoring Devices (MMD). Test / Calibration certificates shall be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL. All calibration shall be traceable to national or international standards.
15.2	CONSUMABLES
15.2.1	The contractor shall provide all consumables required for carrying out the work covered under these specifications excepting those which are specifically indicated as BHEL scope. Erection, commissioning jobs should not suffer due to non-availability of these types of consumables. Failure to arrange the same in time may call for BHEL's intervention and BHEL shall arrange the same at contractor's risk and cost with BHEL's standard overhead charges.
15.2.2	All consumables/special materials/cements/paints etc. arranged by the contractor to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports / certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.