CONTENT

TECHNICAL CONDITION OF CONTRACT FOR ERECTION , TESTING & COMMISSIONING OF U#3 AIR COOLED CONDENSER AND AUXILIARIES OF 3 x 660 MW NORTH KARANPURA PROJECT.

These Technical conditions for erection and commissioning of AIR COOLED CONDENSER & AUXILIARIES shall be construed as part of tender document and shall be read along with general conditions of contract (GCC), and other volumes of tender. In case of any conflict or inconsistency between GCC, other volumes and these Technical conditions contract (TCC), 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	**PROJECT INFORMATION**
1.1	Details of proposed units: North Karanpura Super Thermal Power Project (3x660 MW), a pit head coal based thermal power project, is located in Hazaribagh and Chatra districts of Jharkhand State. Basic inputs i.e. coal, water and land have already been tied up. The project is proposed for the States & Union Territories of Northern, Western and Eastern Regions and the State of Jharkhand. The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each.
	APPROACH TO SITE
	The power project is proposed to be located near Tandwa town in Chatra district in the state of Jharkhand on Hazaribagh-Chatra State highway at a distance of about 50 kms from Hazaribagh city. The nearest commercial airport is Ranchi at a distance of 150 kms from project site. The nearest railhead Khalari Railway Station on Ranchi-Garhwa section of Eastern Railways is about 40 kms from project site.
2.0	**SITE VISIT**
	Contractor should visit site and acquire full knowledge & information about site conditions. The bidder must visit site, to acquaint themselves with the conditions prevailing at site and in & around the plant premises, together with all statutory, obligatory, mandatory requirements of various authorities before submission of bid.
3.0	**NAME OF WORK**
	Erection, Testing & Commissioning of U#3 Air Cooled Condenser and associated auxiliaries, which includes material receipt from store, transportation to site, erection, testing, commissioning, trial run, handing over etc, as required, for total scope defined in this specifications along with other document of complete work of erection & commissioning of Air Cooled Condenser covering Structures, finned tube bundles, Steam Distribution manifold, Axial Fan system, Wind wall structures, Elevators, Air Removal system, Condensate System, Steam Ducting, Draining System, Cleaning System, Lifting devices, Insulation, Finish Painting etc. of **AIR COOLED CONDENDER (ACC) with associated Auxiliaries for unit#3 at 3X660 MW North Karanpura Project in Chatra district, Jharkhand.**
4.0	**BROAD SCOPE OF WORK**
4.1	The intent of this erection specification is to provide services for execution of the project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services/ facilities to complete the work or portion of work awarded to him. The quoted/ accepted rates/ price shall deem to be inclusive of all such contingencies.

4.2.1	The work to be carried out under scope of this specification covers complete work of ACC Unit#3 covering receipt from stores/ yard located within project premises, arranging their issue, transportation to site, temporary storage prior to erection, if required, cleaning, preservative painting, Fabrication, erection, alignment, welding, leveling, adjustment etc including finish painting, all pre-commissioning tests, start-up and trial run of individual equipment, final commissioning, trial run and handing over of units to BHEL/ their customer including performance & guarantee (PG) test of units, reconciliation of materials issued to contractor & returning unused materials to BHEL stores/ yard/ places designated by BHEL OR CUSTOMER. The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during erection. If any portion of works is found to be defective in workmanship & not conforming to drawings/ documents or other stipulations, the contractor shall dismantle and re-do the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
5.0	**DETAILED SCOPE OF WORK** The scope of work under this contract covers Erection and commissioning of Air Cooled Condenser and Auxiliaries, Air Removal system, Condensate System, Steam Ducting, Draining System, Cleaning System, various piping etc. of Unit no. # 3 with required Structures, platforms, stairs, Hoist and Chain Pulley Blocks, EOT cranes, temporary passenger elevators etc. However, depending on site requirements, successful bidder may be deployed in other 2 balance units (unit#1 or unit#2) for the jobs as decided by BHEL engineer, which would be executed at applicable accepted rates of rate/price schedule.
5.1	**Steam Exhaust System**
	The scope of work of the contractor for Air Cooled Condenser will be inclusive but not limited to following:
	Main Steam Duct
5.1.1	• The scope of work includes receipt from open storage yard, stores, handling, pre-assembly, preservation, erection and commissioning etc. of following major systems -
5.1.2	• Preassembly and erection of expansion joints and main steam ducting including blank plate.
5.1.3	• Preassembly and erection of elevated horizontal ducting.
5.1.4	• Welding of the steam exhaust duct & distribution manifold in accordance with WPS and procedure.
	Steam duct Riser
5.1.5	• preassembly & erection & welding of riser.
	Steam Distribution Manifold
5.1.6	• Erection of steam Distribution Manifold and condensate Header and vacuum system and checking of Alignment.
5.2	**Tube Bundle System:**
	Tube Bundles
5.2.1	Preparation of Bundles.
5.2.2	Installation of Bundles, alignment and welding in accordance with procedure.
	Condensate Header
5.2.3	Erection and alignment of Condensate manifold and doing associated piping job
5.3	**AIR MOVING SYSTEM**
	Fans
5.3.1	Sorting out of fan deck beam and fan deck plates and placing up at fan deck level. Securely fixing of fan deck plates against falling down due to wind or other external force.
5.3.2	To prepare temporary supporting arrangement for assembling the motor bridge.
5.3.3	Erection of gearboxes, motor, fan hub and blades etc.
5.3.4	Erection of structural parts like: handrails,, gratings etc
5.3.5	Assembly of fan screen, fan ring.
5.3.6	Whole assembly of fan ring and safety screen shall be erected on it's support at fan deck

	level.
5.3.7	Fan bell shall be fixed onto the supporting plates of fan deck structures through bolting connection.
5.3.8	Assembly and erection of air inlet bells.
	Gear Box
5.3.9	Erection of fan gear box and filling of lubrication oil as per procedure and specification.
	Fan Bridge
5.3.10	Erection of assembled motor bridge or individual assemblies at fan deck level.
5.3.11	Completion of all structural works for fan erection purpose.
5.4	**STRUCTURE (UPPER)**
	"A" Frame Structure
5.4.1	Pre-assembled A-Frames to be erected followed with erection of Top Girders, Distance Bracings, Diagonal Bracings and Monorails.
5.4.2	Installation of internal and external doors.
5.4.3	Fixing of intermediate cladding sheet on the internal and external "A Frames".
	Wind wall Structure
5.4.4	To fabricate wind wall structures and necessary sheeting works and erection of same as per drawing.
5.4.5	Complete ACC and auxiliaries supporting structural steel, walkways, platforms, ladders and gratings, hand rail, stair cases as per drawing including inter connecting walkways and connecting platform, elevator, chequered plates, kicker / toe-guard plates wherever required, foundation bolts, nuts, fasteners, inserts, anchor channels, base plates, packers, shims, pipe sleeve for equipment and columns under scope.
5.4.6	Erection of Elevator and stair case structure including its bracings, connecting members and cladding structures.
5.5	**AIR EVACUATION SYSTEM / VACUUM SYSTEM**
	Piping and Tube-Walls
5.5.1	Piping and erection of Tube walls/bundles shall be done as per PID drawings.
	Vacuum Pump and it's Piping
5.5.2	Erection, Testing and Commissioning of Vacuum Pumps
5.5.3	Piping for Air Take-off lines between secondary bundles and its holding pumps.
5.6	**TANK AND DRAIN SYSTEM**
5.6.1	Erection of Drain Tank and its Piping
5.6.2	Erection of Drain Pump and its piping
5.6.3	Erection of Condensate Tank and its Piping
5.6.4	Erection of condensate lines between condensate manifolds and turbine exhaust box.
5.6.5	Prefabrication and erection of condensate and air take-off piping.
5.6.6	Main Piping job as per approved drawing.
5.6.7	Erection of condensate pump and its Piping.
5.7	**OTHER MISC. ITEMS**
	Cleaning System along with Ladder
5.7.1	Erection of valley walkway structures, laying of gratings including erection of cleaning ladders.
5.7.2	Erection of cleaning system, pump and associated pipe works.
5.7.3	Erection of Stairs, Electric Hoist, Chain Pulley Blocks, EOT cranes and Temporary Passenger Elevators to facilitate ACC erection work.
5.8	**Erection of Lifting Devices and obtaining Statutory Clearances**
	EOT Cranes (Upto 20 MT handling capacity), Misc. Hoist (Mech/Electrical), Chain Pulley etc.
5.8.1	Erection, Commissioning of EOT Cranes, Misc. Hoists (both mechanical and electrical), Chain Pulley Blocks etc. including obtaining statutory load testing of the erected lifting devices through accredited agency who are authorized to issue such kinds of certificates.
5.9	**General Guidelines of Erection Process.**
5.9.1	Contractor shall carry out scrapping and blue matching of embedded plates / packers of rotating equipments. Chipping and the leveling of concrete surfaces, fine dressing up to the

	extent required to obtain contact between packer and concrete, is also covered in the scope of this work. Scrapping, chipping and matching shall be done so as to achieve prescribed percentage of contact between the two surfaces.
5.9.2	Complete grouting of structures, equipments, including anchor / foundation bolts, beneath base, base hollows etc. as may be applicable, is included in the scope of contractor. Arranging all labour, building materials including quick setting – free flow – non-shrink grout mix (e.g. srinkcomp, conbextra etc), form work, shuttering, and any other requirements are in the contractor's scope and to be supplied and executed within the quoted rate. Contractor shall obtain approval of BHEL for cement (quick setting – free flow – non-shrink grout mix) prior to supply and use. Cleaning of foundation surfaces, pocket holes and anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods, are within the scope of this specification / work.
5.9.3	After the grouting has finally set and cured, alignment of equipments involved shall be checked again to verify for any disturbance or any other reason. If required, de-coupling of equipments has to be done for conducting the verification. In case any disturbance is noticed the cause, if any, shall be removed and re-alignment done as part of work.
5.9.4	Foundation and other necessary civil works for supporting structures, equipment etc, will be provided by BHEL/ customer. The dimensions of the foundation and anchor bolt pits shall be checked by contractor for their correctness with respect to the above access as per the erection drawings. Further, top elevation column foundations shall be checked with respect to bench-mark etc. All minor adjustment of foundation levels dressing and chipping of foundation surfaces etc. up to 30 mm as may be required for the erection of equipment/plants will be carried out by the contractor without any extra cost. All foundations and anchor points required for installing winches, shall be cast by the contractor using his own materials at his cost. Grouting of all columns, equipment base plates, anchor bolt holes etc are included in the scope. The grouting mixture shall be either composed of port land cement or ready mix grout of proved quality. However, in both the cases Contractor will supply portland cement and ready mix grout component respectively. Application of the two options will depend on drawing/specification/ instruction of BHEL Engineer. The contractor shall arrange for sand, stone chips, gravels, anti shrink compound, plasticizer, shuttering, grout mixing machine, labours etc at his cost. The contractor shall prepare the required test pieces/test cubes to ensure the strength of grout and get the same tested in laboratory at his cost. Test cube shall also be taken during grouting for testing in the laboratory and shall be tested at his cost.
5.9.5	The grout shall be high strength grout having a minimum characteristic compressive strength of 60 N/mm2 at 28 days. The grout shall be chloride - free, cement based, free flowing, non-metallic grout.
5.9.6	The Grout shall have good flowability even at very low water/ grout powder ratio.
5.9.7	The Grout shall have characteristics of controlled expansion to be able to occupy its original volume to fill the voids and to compensate for shrinkage. Grout shall be of pre-mix variety so that only water needs to be added before use.
5.9.8	The mixing of the Grout shall conform to the recommendations of the manufacturer of the Grout.
5.9.9	After the base has been prepared, its alignment and level has been checked and approved and before actually placing the grout, a low dam shall be set around the base at a distance that will permit pouring and manipulation of the grout. The height of such dam shall be at least 25mm above the bottom of the base. Suitable size and number of chains shall be introduced under the base before placing the grout, so that such chains can be moved back & forth to push the grout into every part of the space under the base.
5.9.10	The grout shall be poured either through grout holes if provided or shall be poured at one side or at two adjacent sides to make the grout move in a solid mass under the base and out in the opposite side. Pouring shall be continued until the entire space below the base is thoroughly filled and the grout stands at least 25 mm higher all around than the bottom of the base. Enough care should be taken to avoid any air or water pockets beneath the bases.

5.9.11	In addition to the above, recommendations of Grout manufacturer shall also be followed.
5.9.12	The poured grout should be allowed to stand undisturbed until it is well set. Immediately thereafter, the dam shall be removed and grout which extends beyond the edges of the structural or equipment base plates shall be cut off, flushed and removed. The edges of the grout shall then be pointed and finished with 1:2 cement mortar pressed firmly to bond with the body of the grout and smoothened with a tool to present a smooth vertical surface. The work shall be done in a clean and scientific manner and the adjacent floor spaces, exposed edges of the foundations, and structural steel and equipment base plates shall be thoroughly cleaned of any spillage of the grout.
5.9.13	After the grout is set and cured, the Contractor shall check and verify the alignment of equipments, alignment of shafts of rotating machinery, the slopes of all bearing pedestals, centering of rotors with respect to their sealing bores, couplings, etc. as applicable and the like items to ensure that no displacement had taken place during grouting. The values recorded prior to grouting shall be used during such post grouting check- up and verifications. Such pre and post grout records of alignment details shall be maintained by the Contractor in a manner acceptable to the BHEL / Employer.
5.9.14	For pre-assembly of ACC components, necessary pre-assembly bed shall be constructed by the vendors. Concrete blocks required for preparing such pre-assembly bed shall be cast/brought by the vendor within his quoted price.
5.10	**PIPING**
5.10.1	Brief list of System / sub-system to be erected by the contractor & approximate weight are given in the appendices enclosed are meant for giving general idea to the bidders only about magnitude of the work involved. The piping components are sent in parts for convenient transportation / layout requirements. They are to be cleaned, pre-assembled in stage by stage, welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers.
5.10.2	Deleted
5.10.3	Pre-assembly of equipment at the pre-assembly yard for inspection, checking and erection. It is to be noted that BHEL will provide only reasonably leveled open space for pre-assembly yard. The contractor has to arrange further desired leveling of the area at their cost. The fixtures, steel structures required for temporary supporting for pre-assembly, checking, and welding for lifting and handling during pre-assembly and erection shall be arranged by the contractor at his own cost. Steel for such work if required shall be arranged by the contractor.
5.10.4	Welding non-destructive testing and heat-treatment as prescribed in BHEL Welding / Heat treatment manual is to be carried out by the contractor. The contractor shall conduct non-destructive tests like radiography, ultrasonic test for weld defects etc., ultrasonic test for finding thickness dye, dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipments etc. as per BHEL Engineer's instructions within the quoted rate.
5.10.5	Deleted
5.10.6	Contractor shall arrange the necessary clearance from other statutory authorities as required for installation of the plant and equipment and render all assistance, service required in this regard. Necessary co-ordination with statutory authorities including transportation, as required, for regular visit to site, is included in the scope of the contractor. However, inspection fee, if any will be reimbursed by BHEL.
5.10.7	Carrying out piping as per the specification between equipment constituting terminal points, whether the terminal equipments fall with in the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment need correction by suitably resorting to heat correction or other method as instructed by BHEL Engineer, the same need to be done by the contractor within the quoted rate.

5.10.8	All the works such as cleaning, inspection, edge preparation if required, cutting, weld depositing, grinding, straightening, chamfering, filling, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work with in the quoted rate. Major machining work (which can be carried out in workshops only, as decided by BHEL, like tie-rod machining, any job to be carried on lathes, shapers etc. etc.) shall be done/arranged by the contractor at his cost.
5.10.9	Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges, re-prepare the edges to suit site conditions, which shall be done by the contractor at no extra cost. All fittings like elbows, tees, reducers, flanges, inserts etc., shall be matched with pipes for welding which may require re-edge preparation, grinding etc.
5.10.10	The valves will have to be checked, lapped or overhauled in full or in parts before erection / after chemical cleaning / during commissioning. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.
5.10.11	All the bearings, Gearboxes etc., of the equipment / actuators and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the Engineer for cleaning the bearing / gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing / lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.
5.10.12	The contractor shall take necessary measures to see that all the machined surfaces preserved and covered.
5.10.13	Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismount such instruments and re-erect whenever required prior to commissioning. Some time this may have to be handed over to store or instrumentation contractor.
5.10.14	All dimensions / elevations refers to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice.
5.10.15	For pipes nominal size 2'' and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above sizes if the routing is shown in layouts it is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site Engineer's advice. Piping below size 2'', valves, flanges, fittings etc., shall be supplied as commercially available. Hence fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.
5.10.16	Contractor should fabricate bends of </=2" diameter size from running metres of pipe.
5.10.17	Slope of 1:500 shall be maintained towards drain unless otherwise specified.
5.10.18	All site-fabricated pipes will be issued in running meters as straight length. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. In some cases, attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing. Necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor.
5.10.19	Fittings like bends, tees, elbow/bends, reducers, flanges etc., will be supplied as loose items.
5.10.20	Certain adjustments in length may be necessary while erecting pipelines and the contractor should remove the extra lengths/add extra lengths / to suit the final layout after preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work.

5.10.21	Adjustment like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL Engineer to suit the layout, with specified heat treatment procedure with in the quoted rate.
5.10.22	Pipes above 2'' diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. For pipes below 2'' diameter, shall be cleaned by sponge with air flushing.
5.10.23	Hangers & suspensions, supports etc. for tubes, piping etc will be supplied in running / random lengths / sizes which shall be cut to suitable sizes and adjusted as required within the quoted price.
5.10.24	Contractor shall arrange all the equipments, alignment bolts, tools, consumables like welding electrodes (all type), Filler wire for TIG welding and argon gas cylinders etc., for welding of pipes at his cost. Consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are in contractor's scope.
5.10.25	Contractor shall use only bolted clamps for achieving alignment of piping, wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipments, the same shall be subjected to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., and not by hammer. Any burns left on the equipments / piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect surface and sub-surface cracks in these ground areas.
5.10.26	All the weld joints on equipments and piping shall be ground or filled on completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.
5.10.27	Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.
5.10.28	Flame cutting of piping shall be strictly done as per BHEL Engineer's instructions and in his presence only.
5.10.29	Wherever elbows of 45 deg or any other angle (>2" dia pipe) are required, the same shall be cut from 90 deg. Elbow supplied and used. No extra cost shall be paid.
5.10.30	The work on piping systems (air, water, oil steam, gas etc.) will include laying, edge preparation, fixing and welding of the elbows / fittings / valves etc., welded on the lines, fixing and adjustment of supports / hangers / shock absorbers and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and / or as per approved drawings/ documents.
5.10.31	Deleted
5.10.32	Flow nozzles, orifice, spray nozzles etc shall be mounted / erected after chemical cleaning / flushing / or steam blowing at site.
5.10.33	Erection of flow switches, steam traps, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting the materials from BHEL / Customer stores, transport at site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.
5.10.34	Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.
5.10.35	All drains / vents / relief / escape / safety valve piping to various tanks / sewage / drain canal / flash box / flash tank / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by the contractor is completely covered in the scope of work.
5.10.36	Contractor should fabricate bends at site from running meters of piping for the above and cut, edge prepare and lay the piping as per BHEL Engineer's instructions.
5.10.37	Fixing / fitting / welding of thermo wells, stubs, tapping points, root valves and instruments etc., on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is the scope of this specification.
5.10.38	Thermo-wells erected on the pipelines by other agencies shall be welded by Piping vendor

	treating it within piping vendor's scope.
5.10.39	Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor. Other supports namely Hangers, U-clamps etc. shall be supplied by BHEL duly bent and threaded. Assembly and necessarily cutting work shall be carried out at site by contractor within the quoted rate.
5.10.40	For Hangers and support the instruction given in the drawing & documents must followed for handling, erection, setting of COLD / HOT values and logging etc.
5.10.41	Wherever hanger and support materials of piping are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the piping system on temporary supports to ensure the progress of work within quoted rate. The required structural steel materials will be issued on free of charges by BHEL, either from scrap / spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports. No additional payment shall be considered for such contingency measure.
5.10.42	The contractor has to erection of control valves and other items as per approved documents and drawings.
5.10.43	Fabrication and erection of the approach platforms for accessing eqpts/valves/systems erected by the contractor are included in the scope of work. Necessary structural materials will be provided by BHEL.
5.10.44	Laying, aligning, welding, fixing, radiography, ultrasonic testing, stress relieving, chemical cleaning. Flushing, pickling of all the pipe lines shall be in the scope of contractor's work and forming part of piping erection.
5.10.45	Installation of Isolating Devices and removal & re-fixing of internals required for Hydraulic Testing, Pre-commissioning and Commissioning activities are also to be done by the contractor within his quoted rate.
5.10.46	The following items of work shall form part of piping erection: a) Matching of flanges for achieving parallelism and alignment resorting to heat correction or other suitable methods as per instructions of BHEL Engineers. b) To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc., of suction, discharge, re-circulating and other connected piping and its supports at a number of place. c) Fabrication/Forming of bends for pipes having dia upto 65 mm OD. d) Servicing of valves, actuators and fittings. e) On all steam piping, water (DM / Raw / Condensate / Cooling) Piping, Oil Lines / Piping, Instrument air piping. Etc., where butt welding is involved, root TIG Welding and subsequent Arc Welding shall be adopted as instructed by BHEL Engineer. The decision of BHEL Engineer regarding welding procedure for welding of above lines will be binding on the contractor. f) Pipes / Tubes / Structural Materials, which are issued in running meters, may not be sent in standard lengths. g) Pipe lines of Oil, Air, Steam and Water of less than NB 65 mm will be field routed as per schemes approved at site or as per the instructions of BHEL Engineer, and will be supplied in random lengths / Running lengths. The contractor shall have to lay the piping according to instructions at sites, after carrying out the necessary fabrication, edge preparation, routing etc., in best professional manner and as per instructions. The supports for field routed piping will be fabricated and erected by the contractor as per the requirement of the work. **On completion of such Pipings, AS-BUILT Drawings to be prepared and submitted for record. The RTF of all such Drawings needs to be submitted along with 4 copies of the drawings**. h) The location of drain headers, valves, stations, steam traps of piping as indicated in the BHEL drawings are suggestive only. The final location and routings shall be decided to suit the site conditions. While routing such lines and fixing the stations, it has to be erected so as to provide easy accessibility and free path for the purpose of easy operation and maintenance. These locations shall be acceptable to the client. Sometimes, the locations of stations and routing of lines may have to be changed as

	per the site conditions. All such works shall be carried out expeditiously as per the instructions of BHEL Engineer. The decision of BHEL Engineer is final and binding on the contractor. i) It may be necessary to initially erect the pipes on temporary supports and after alignment and welding transfer the load on permanent supports. j) All temporary lines required for Chemical Cleaning, Hydraulic testing etc., shall be supplied in 'As is Where is' condition. The contractor shall arrange to carryout the required dressing, grinding, cleaning, cutting, edge preparation etc., while carrying out erection. Only payment against the erected tonnage will be admitted by BHEL as per the rate applicable for piping job. No extra claim on account of fabrication / rectification work will be entertained. For human protection, temporary insulation over piping to be applied at no extra cost. k) All the instrumentation Tap-off points like thermowells, Root Valves, Impulse lines, nipples, PG-test thermowells etc., shall also be erected and welded by the contractor irrespective of whether such materials are supplied by BHEL or any other agency. l) For all the control valves, mechanical commissioning to be done by the contractor. **m)** The weld Grooves of pipes will be as per BHEL standard specifications. Further, the edge preparation shall be done as per instruction of BHEL site Engineer and same shall be binding on the contractor.
5.11	**PAINTING SHADES AND PAINTING SCHEDULE – ACC & Auxiliaries.**
5.11.1	Final painting as well as Primer painting (wherever applicable) of ACC & Auxiliaries is included in the scope of the contract. The supply and application of field painting for the entire scope of work (Package) is in the scope of contractor as the job to be carried out as per approved FQP and painting Procedure. Paints shall be of approved manufacturer of specified colour and shade. Applicable Painting schedule as per NTPC Technical Specification for North Karanpura Project and the Painting Sheds as to be applied for painting of ACC & Auxiliaries is enclosed with this Tender specification. Vendor to take note of the same while quoting. Also, supply and application of touch-up painting & preservative painting of equipment and material in the custody of the contractor, as per requirement included in the scope of contractor.
5.11.2	Painting of all exposed metal parts of the equipment, structure, auxiliaries, few piping, after thoroughly cleaning all such parts of all dirt, rust, scales, grease, oils and other foreign materials by wire brushing scrapping, any other method as specified by supplier/ as per requirement of BHEL is included under the scope of the Contractor. Before application, the surface being painted need to be inspected and approved by the engineer. All applicable surfaces and un-insulated piping surfaces shall have to be painted with two coats of primer of red-oxide zinc chromate (IS-2074). The gas cut stubs would require to be ground and rounded before painting.
5.11.3	Required quantities of paints of the brands approved by BHEL engineer to be provided by contractor free of any charges within the quoted price/ rate. Before application, the paints and primers need to be inspected and cleared by BHEL engineer. Other tools & consumables including scaffolding materials required for finish painting also shall be supplied by contractor at no extra cost to BHEL.
5.11.4	Certain equipment like control panels etc shall require spray painting. The contractor shall make arrangements of the required equipment for spray painting of such equipment at his own cost. Spray painting at the job site shall be permitted only at times and locations approved by the owner/ Engineer.
5.11.5	The insulated pipe lines though not to be painted but to be provided with colour bands as specified for each system in the color code scheme. The contractor shall provide legends with direction of flow on equipment and piping in size specified by Engineer. Letter writing shall be done in Hindi/ English or in both languages.
5.11.6	Surface preparation as necessary for weld joints before painting shall be carried out by the contractor. Final painting is to be carried out by the contractor for those items /equipment

	which will be welded at site. Item like fan, gear box, motors, pumps, drain tank etc will be supplied in painted condition. If final touch up are required, it will be done by contractor**.**
5.12	**SPECIAL PRECAUTION TO BE TAKEN DURING ERECTION**
5.12.1	**Bolting**
	All bolts shall be torque tightened at specified value of torque limit.
	Bolts fastening of hub, blades and retaining plates should be fixed as per recommendation specified and shall be recorded suitably.
5.12.2	**Site welding Principles**
	Site-Welding assemblies are foreseen and shall be indicated on drawing. Welding shall be done as per approved WPS. Bidder shall prepare Welding procedure and submit the same for approval of BHEL/NTPC.
	Welding Map: Each weld should be itemized with a particular reference number recorded in and listed on the record sheet with its location in the WPS.
5.12.3	**Erection WPS**
	Erection WPS shall be prepared as per recommendation of main equipment supplier.
	Additional WPS for materials having thickness above 1" and special treatments should be submitted for approval and job to be executed as per approved WPS.
5.13	**RECORDING OF DEVIATIONS AND ACCEPTED TOLERANCE IN CONSTRUCTION WORKS**
5.13.1	The maximum and minimum deviations admitted must be recorded and evaluated before construction
5.13.2	Deviations must be recorded for all the erected structures, equipment, fans, pumps etc.
5.14	**COLLECTION AND RETURN OF MATERIALS**
5.14.1	The Contractor identify, arrange issue and shall collect the materials from storage yard/Stores/Sheds of BHEL/ Client. He shall verify the materials being issued to him, keep them in safe custody, watch and ward of materials after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the Client. The contractor shall note that the transport of equipments to erection site, assembly yards etc., should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators, etc., shall be stored, when taken over by the contractor, in appropriate manner as per BHEL's instructions and as per BHEL's Storage and Preservation Manual.
5.14.2	BHEL is operating Computerized Site Operations Management System (SOMS) that includes materials management, progress reporting, sub-contractor billing and material reconciliation through a computerized data base management system. Contractor shall engage personnel with proficiency in operation of such Computerized System for the purpose of usage and regular updation of data base Management System. The SOMS/software package shall be provided by BHEL to the contractor on free of cost basis. However, the contractor shall deploy their manpower for its usage etc. at their cost, for carrying out their portion of work as per tender condition.
5.14.3	The contractor may note that all operations in their scope which have interfaces with BHEL systems will have to be done only through this computerized system. The vendor has to make all arrangements for connectivity, computing equipment, personnel, software, etc. To operate and interact with BHEL system. No manual systems other than what is not covered by computerized system will be acceptable at site.
5.14.4	The vendor within his quoted rate has to arrange Primavera/MS Project software Package with trained operator for regular updation of erection network on monthly submission to BHEL by 20th of every month. This regular updation has to be done with BHEL's approval.
5.14.5	The contractor has to make their own separate arrangements for their portion of on /MIRs/other activities.
5.14.6	In the event the computerized SOMS is inoperative for any reasons, the contractor shall take delivery of materials from the storage area/sheds of BHEL/Customer after getting the approval of the Engineer/Customer on standard indent forms to be specified by

	BHEL/Customer. All these records however shall be updated in the SOMS as and when the SOMS is reactivated/normalized by the contractor treating at his scope of work.
5.14.7	The contractor shall handover all materials remaining extra over the normal requirement with proper identification tags in properly segregated and cleaned condition to BHEL sites. Smaller materials, Lubricants, Chemicals etc. shall be returned in neatly packed condition in addition to the above requirements. In case of any misuse or use over actual design requirement, BHEL will recover the cost of parts / materials used in excess or misused. Decision of BHEL Engineer in this regard will be final and binding on the contractor.
5.14.8	All materials shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings, etc., shall be used for handling of the materials. **Use of polyester webbed flat slings with proper capacity shall be mandatory for all delicate materials**. The equipment from the storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.
5.14.9	Contractor shall remove all scrap materials at least once in a week from various levels of ACC/ TG Floors, working area of ACC / Piping around Power Station and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.
5.14.10	All the damaged materials, package materials/containers, special transporting frames, gunny bags, etc., shall be returned to BHEL stores / Client's stores by the contractor and proper receipt obtained for accounting/reconciliation.
5.14.11	All pipes and tube ends of pipes/tubes issued to contractor and kept at site for erection shall be covered with plastic caps/ steel caps or shall be closed with wooden plugs by the contractor. The plastic caps / Steel caps / wooden plugs will be provided by BHEL free of cost.
5.14.12	The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are erected in position.
5.14.13	Contractor shall plan and transport equipments/components from storage yard/sheds to erection site and erect them in such a manner and in a sequence that material accumulation at site should not lead to congestion. Material shall be stacked neatly, preserved and stored in the contractor's shed and work areas in an orderly manner. It may be specifically noted that the space available for putting up the Thermal Plant is very limited and accumulation of material may lead to the necessity of shifting and re-stacking the materials to enable other agencies to carry on with their work or to comply with customer's requirements. If required the contractor shall arrange shifting of surplus material expeditiously failing which the same will be arranged by BHEL and all charges together with departmental charges at 30 % will be recovered from his bill.
5.14.14	DELETED
5.14.15	During trials/ tests, pre-commissioning/ commissioning, replacing/ changing mechanical / other seals of equipments like pumps, removal and cleaning / replacing of filters etc. is within the scope of work. Replacement spares for this purpose will be provided by BHEL.
5.14.16	Commissioning activities will continue till the completion of trial operation. During this period contractor shall make available the services of separate dedicated workforce comprising of suitable skilled and semi-skilled / un-skilled workmen and supervisory staff along with necessary tools and plants, consumables etc.
5.14.17	Performance of guarantee test: The final performance and guarantee tests of the unit to establish the guaranteed parameters shall be carried out by BHEL. Contractor shall assist BHEL by providing required manpower, tools and consumables for carrying out the above tests. All preparatory works and temporary connections required for performing the above tests shall be carried out by the contractor free of cost.
5.14.18	The instruments required for conducting PG test shall be provided by BHEL free of charges and the contractor has to provide manpower assistance and other necessary inputs like scaffolding, hand tools & related consumables etc. for the same with a deployment of about fifty man-months approximately.

5.15	**WELDING, RADIOGRAPHY AND OTHR NON-DESTRUCTIVE TESTING, POST WELD HEAT TREATMENT**
5.15.1	Installation of equipment involves good quality welding, NDE checks, post weld heat treatment etc. Contractor's personnel engaged should have adequate qualification on the above works. Qualified minimum 1 nos NDT Engineer is to be deployed at site with ASTM/ISMT level II certification in RT, UT, LPT, MPI.
5.15.2	The method of welding (viz) arc,TIG or other method will be indicated in the detailed drawing / documents. BHEL Engineer will have the option of changing the method of welding as per site requirement.
5.15.3	All welders shall be tested and approved by BHEL Engineer before they are actually engaged on the work even though they may posses the requisite certificates. BHEL reserves the right to reject any welder without assigning any reasons. The welder identification code as approved by the BHEL Engineer shall be stamped by the welder on each joint done by them. Suitable recording shall be made available by the contractor to identify which joint has been welded by which welder. The contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by BHEL/statutory body /customer. Only welders who are qualified in accordance with the latest applicable requirements of the Statutory Regulations, shall be permitted to perform any welding work on the pressure parts. In addition to such statutory qualification requirements, the welders shall also undergo a satisfactory pre-production qualification test to be conducted by the Contractor at site in consultation with and to the requirements of the Employer, prior to performing work under these specifications. The services of an independent testing laboratory shall be retained by the Contractor to perform welder qualification tests for welders. All the welders carrying out welding at site, shall carry an identification badge, which shall indicate the category and the grade of welding for which they have been tested and authorised to carry out welding. All such badges shall be countersigned by the Employer.
5.15.4	All welded joints shall be subjected to acceptance by BHEL Engineer/statutory body/customers. Contractor has to arrange for regular evaluation of radiographs without accumulation of any backlog. Necessary evaluation fees only will be paid by BHEL / Customer in this regard. Repair work and re-sampling also shall be taken up promptly, without piling any backlogs.
5.15.5	Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved welders.
5.15.6	All the welders (structural and high pressure) shall be tested and approved by BHEL Engineer before they are actually engaged on work though they may possess the IBR / other certificate. BHEL reserves the right to reject any welder without assigning any reason. Pipe & Tubes for simulation test of HP welders shall be supplied by BHEL free of cost. However, for revalidation test of these welders as well as Non-IBR welders, the required Pipe / Tube / Plate is to be arranged by the contractor.
5.15.7	Unsatisfactory and continuous poor performance may result in discontinuation of concerned welder.
5.15.8	The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this consumables like paint / primer etc. will be in the contractor's scope.
5.15.9	Joint fit-ups, should be protected, where required, by use of tapes / protective paint as may be prescribed by BHEL. The contractor shall supply consumables like protective paints / tapes etc.
5.15.10	The contractor shall maintain welding records in the form as prescribed by BHEL containing all necessary details, and submit the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability of the welds shall be final.
5.15.11	In execution of this work, considerable number of socket weld joints is involved. The exact quantity of such socket welds or probable variation in the quantum cannot be furnished. The tenderer shall take notice of this while quoting, as no extra claim on this account will be entertained at a later date. The socket welding on HP parts / HP piping shall be done by the IBR qualified welders. In case the contract provides for payment / recovery on account of

	variation in the quantity of butt weld joints. Modification work, involving socket weld joints will be paid on the basis of extra man-hour rate only. Contractor has to adhere to the procedures / specification as indicated in the drawing for socket welding.
5.15.12	All butt joints of tubular system of ACC and piping shall be carried out by TIG root-run and subsequent runs by arc welding. Full TIG welding, wherever necessary shall be carried out within the quoted rates. For oil system piping, root run of all the butt joints shall be carried out by TIG welding only. The filler wires required for TIG welding of tubular joints are in the supply scope of bidder.
5.15.13	Contractor shall provide all resources and make all arrangements for the radiographic examination of welds for this work. For reasons of safety, invariably the radiography work will be carried out after the normal working hours and close of other site activities only.
5.15.14	Radiography inspection of welds shall be performed in accordance with requirements and recommendation of BHEL Engineer. The quantum of radiographic inspection shall be as per provision of IBR / BHEL's erection documents. They may, however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer.
5.15.15	All X-ray / gamma ray films of weld joints shall be preserved properly and be handed over to BHEL / IBR authorities and requisite clearances shall be obtained by the contractor. The contractor shall be fully equipped with radiography equipment, films, chemicals and other dark room facility. There must be a number of radio-graphic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time. Contractor's radiographers shall also be registered with BARC for film badge service. For preliminary evaluation of radiographic films, the contractor must deploy competent personnel having at least ASNT / ISNT Level-II certification. He should also ensure compliance of all statutory requirement with respect to health hazard in handling the radiographic sources. The contractor shall also furnish along with their offer, the names of approved high pressure welders in TIG welding and alloy steel arc welding.
5.15.16	Although, only Ir-192 radiography source have been envisaged, hence provision for arranging Co-60 source with special permission of BARC is to be arranged by the contractor, if required.
5.15.17	Test facilities shall be established / sourced expeditiously and testing shall be conducted regularly ensuring that no backlogs are piled up. If the contractor does not carry out radiography work in time due to non-availability of film, chemicals, etc, BHEL may get the work done through some other agency at the risk and cost of the contractor.
5.15.18	The field welded joints shall be subject to dye-penetrant / other non-destructive examination as specified in the respective engineering documents / as instructed by BHEL.
5.15.19	Where required, surface preparation, like smooth grinding of welded area, prior to radiography shall be done. It may also become necessary to adopt inter-layer radiography / MPT / UT depending upon the site / technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The contractor shall take all these into account in his offer.
5.15.20	Pre-heating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the contractor in accordance with BHEL Engineer's instructions. Radiography / Ultrasonic testing / Stress relieving vendors may be deployed at site after obtaining concurrence from BHEL site. Normally the electric resistance heating method will be adopted. Contractor shall arrange to supply heating equipment with automatic recording devices. Also, the contractor shall have to arrange for labour, all heating elements, thermocouples and attachment units, graph sheets, non contact thermometers, thermal chalks & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc. required for all heating and stress relieving works.
5.15.21	During preheat/stress relieving operations, the temperature shall be measured at one or more than one points as required by attaching thermocouples and recorded on a continuous printing type recorder. All the recorded graphs for the heat treatment works carried out shall be got signed by the BHEL Engineer prior to the commencement of each cycle and handed over to BHEL on completion. The graphs will be the property of BHEL. The contractor

	has to provide thermal chalks, non contact thermometers, temperature recorders, thermocouple attachment units, graph sheets, etc., required for the job and maintain them in good condition. All temperature recorders should be calibrated by approved agency of BHEL, before use and validity renewed at appropriate intervals, Required fees to be paid for initial and periodic calibrations should be borne by the contractor.
5.15.22	Heat treatment may be required to be carried out at any time (day and night) to ensure the continuity of the process. The contractor shall make all arrangements including labour required for the work as per direction of BHEL. For post weld heat treatment of main stream piping, the induction heating process shall continue un-interrupted. Therefore, contractor shall arrange DG set for the same to take care of power failures.
5.15.23	ON requirement special arrangement for preheating and Post weld Heat Treatment shall have to be done by agency as suggested BHEL erection engineer. Ceramic pad type heater, controller, data logger/recorder, induction heating may be required for some special joints and vendor has to arrange all the required material within his quoted price.
5.15.24	Methodology for sampling for testing of repaired weld joints is given below.
5.15.25	Whenever the quantum of check in any NDT is less than 100 %, guidelines for sampling / re-sampling procedure for NDT as formulated by BHEL will prevail including the following features :
5.15.26	The group of welds for sampling shall be based on welding done by welder in specified continuous time (say work done in a shift or in a day). For further analysis, acceptance or rejection, this group shall be treated as an entity.
5.15.27	From above weld group, the selection of weld joint / weld spot shall be done by BHEL/CUSTOMER as per the quantum of check specified.
5.15.28	For acceptance of the weld group, all samples selected in this group should meet the acceptance norms. In case of any sample(s) found not meeting acceptance norms, following actions shall be taken :
5.16	**Rectification of defective welds and re-testing of the repair.**
5.16.1	Re-sampling by BHEL/ Customer from the same group of welds, with quantum of NDT being double of originally specified quantum (with minimum 2 welds for every defective weld).
5.16.2	In case of any weld from the re-sample, as per above found not meeting acceptable norms, following action shall be taken :
5.16.3	NDT of all the welds of the group, which were not tested in first and second samples. Repair and re-testing of all defective welds. Necessary action on process control and on welder for eliminating recurrence of defects.
5.16.4	For the purpose of sampling, the weld group shall be defined as number of welds in case of smaller diameter of tubes/ pipes (or small welds on structures) while for very large diameter pipes e.g. for vessels/ long welds, the length of weld may be taken as basic unit. Sampling shall also be accordingly in terms of no. of weld joints or length of weld.
5.16.5	Sampling and re-sampling procedure shall be applicable for all the NDT viz RT, UT, DPT, MPI.
5.16.6	Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radio-graphed and new films submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radiographed at Contractor's cost. The evaluation charges in respect of such repeated evaluation shall have to be borne by the contractor.
5.16.7	Results of these processes shall be verified / validated as per requirements of BHEL / client.
5.16.8	Welding electrodes have to be stored in enclosures having temperature and humidity control arrangements. A separate Electrode storage room along with dehumidifier with humidity indicator in the room shall be provided for storing all kinds of electrodes. This enclosure shall meet BHEL specifications.
5.16.9	Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens.

5.16.10	One air conditioned dark room and pit for radiography source of 2 nos. as per BARC standard is to be provided at site.
5.17	Deleted
5.18	**PRE-COMMISSIONING, COMMISSIONING AND POST COMMISSIONING OF THE UNIT**
	The scope of work covers various commissioning activities of the power station as follows 1. Trial run of individual equipments. 2. Suitable chemical cleaning of Piping (if required). 3. Hydraulic test of ACC 4. Hydraulic test of Piping 5. Piping Pressure test by Air-Leak testing method. - Segment wise - For overall system 6. Overall flushing through Steam Dumping of ACC system including all piping, tubes, headers etc. 7. Full Load Operation, trial run, PG test and handing over.
5.18.1	The above activities / tests / trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of customer.
5.18.2	Transportation of oil drums from customer's / BHEL's stores, filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer / BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities / processes mentioned in the above clauses and returning of remaining and / or the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.
5.18.3	Replacing / cleaning of filters of the erected equipments and piping system etc. during pre-commissioning / commissioning stage is within the scope of work.
5.18.4	Chemical cleaning (if necessary) of piping shall be in the scope of vendor within their quoted price. Necessary arrangement for performing chemical cleaning activity is to be done by the vendor however, BHEL shall provide the required temporary pipes & fittings, chemicals and other consumables as to be required in performing this activity.
5.18.5	Deleted
5.18.6	Within his quoted price, Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic test, chemical cleaning and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily. Cables, Starters, Switches etc required for this will be supplied by BHEL free of charges. On completion, the items need to be dismantled and returned to BHEL store as part of regular scope of this contract.
5.18.7	Deleted
5.18.8	Deleted
5.18.9	Deleted
5.18.10	Deleted
5.18.11	Deleted
5.18.12	In case any malfunctioning and / or defects are found during tests, trial runs such as loose components, undue noise or vibration, strain on connected equipments etc., the contractor shall immediately attend to these defects / malfunctions and take necessary corrective measures. If any readjustment and realignment are necessary, the same shall be done as per BHEL Engineer's instructions.
5.18.13	During each stage of commissioning, if any part of the piping needs repair / rectification / re-

	work / replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim, if any, for such repair / rectification / rework / replacement, etc., for reasons not attributable to contractor will be governed by relevant clauses of Special Conditions of Contract. The parts to be replaced shall however be provided by BHEL free of cost.
5.18.14	Pre-commissioning and simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc., all these works need specialized gangs including electricians in each area to render assistance to BHEL Commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilization of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work undertaken round the clock if required. It is the responsibility of the contractor to discuss on day to day / weekly / monthly basis the requirement of manpower, consumables, tools and tackles with BHEL Engineer and arrange for the same. If any time the requisite manpower, consumables, T&P are not arranged then BHEL shall make alternate arrangements and necessary recoveries will be made alongwith overhead charges of BHEL.
5.18.15	Contractor shall cut open works if needed as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.
5.18.16	After the start of continuous operation with coal firing, the commissioning tests and maintenance activities will continue. It shall be the responsibility of the contractor to provide the following category of workers with necessary consumables, tools and tackles and supervision till handing over of the unit to the customer. A. Pipe Fitters / General Fitters / Millwright Fitters - 2 nos. B. Rigger / unskilled workers - 8 Nos. C. Electricians - 2 Nos. D. Supervisor - 1 No. E. Valve Technician - 2 Nos. F. HP Welder - 1 No. The above figures shows only minimum required over and above labour required for completing pending erection commissioning works and clearing check and punch lists. Contractor has to provide number of personnel of various categories as per work demand and necessity at site. These skeleton staff are required after synchronization of the unit for attending to commissioning, post commissioning, operation and maintenance problems and no overrun charges will be payable for providing these services unless left over jobs are also done during this period and the delay in the completion of these jobs is not attributable to the contractor.
5.18.17	It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL Commissioning Engineers involving considerable payment of overtime.
5.18.18	During commissioning, opening of valves, changing of gaskets, checking, resetting of hangers, realigning of rotating and other equipment, attending to leakages in valves etc., and adjustments of erected equipment may arise. All the valves shall be serviced and lubricated to the satisfaction of BHEL Engineer during the erection and commissioning as per BHEL Engineer's instructions.
5.18.19	In case any re-work / repair / rectification / modification / fabrication, etc., is required because of contractor's faulty erection which is noticed during commissioning of at any stage, the same has to be rectified by the contractor at his cost. If during commissioning, any improvement/repair/re-work/rectification/Fabrication / Modification due to design improvement / requirement is involved, the same shall be carried out by contractor promptly and expeditiously. Claims, if any, for such works from the contractor shall be

	governed by relevant Clauses of Extra work.
5.18.20	It is the responsibility of the contractor to provide for necessary labour, tools and tackles and consumables till the completion of work under these specification, even in case erection, testing and commissioning of the piping and other equipments are delayed due to reasons not attributable to the contractor.
5.18.21	Contractor should specifically have electrical and mechanical technicians for servicing and maintenance of valves, actuators and strainers. The Technicians should have the expertise in dismantling the valves, re-assembly and also attending to the problems.
5.18.22	Contractor shall lay/install necessary temporary piping, pumps, valves, gauges, cables, switches etc, for conduct of hydraulic test, This may involve cutting of some portion of existing piping/valves, placing of rubber wedges/ blanks in the valves and other openings Where required, bends have to be fabricated at site from running length of pipe. Temporary installation itself has to be tested, tried, and subject to non-destructive examinations as per the instructions of BHEL as part of work.
5.18.23	All materials, equipments necessary for installation of temporary system as above will be supplied by BHEL in random sizes/lengths. However, servicing, fabrication, erection, dismantling of the same after completion of the process, and returning to BHEL stores shall be the responsibility of the contractor.
5.18.24	Fabrication, fit-up, welding, if any, of requisite blanks for conduct of hydraulic test is art of work. Similarly, removal of blanks, restoration and normalization of the concerned system/line is to be done as part of work. BHEL will provide the material for blanks free of charge. No separate payment is envisaged for these activities.
5.18.25	Commissioning / inspection of electrical inspector for HT motors or other appliances are creating problem in other tender as such specific refer to SCC clauses may be put indicating that erection agency to complete the commissioning along with inspection by statutory body like electrical inspector/CEA as may be required for compliance towards handing over.
6.0	**GENERAL COMMON ERECTION REQUIREMENTS**
6.1	The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.
6.2	The terminal points indicated by BHEL should be final & binding on the contractor for deciding the scope of work and effecting payment for the work done.
6.3	The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful and timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern/ latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.
6.4	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. It shall be the specific responsibility of contractor to arrange for regular certification of his T&Ps on recommended periodicity by authorized representative of Factory Inspectorate. The Cranes deployed by the Vendor should also bear fitness and load test certification from applicable statutory authority. All the certificates shall be readily available at the site store and should be produced on demand.
6.5	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.

6.6	The contractor shall execute the work in the most substantial & workmanlike manner. The stores shall be handled with care & diligence. The contractor shall maintain a store & account for the materials issued by BHEL for the subject work.
6.7	BHEL reserve 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.
6.8	All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/ engineers, consumables etc except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clauses. The contractor's quoted rates should be inclusive of all such contingencies.
6.9	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.
6.10	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.
6.11	Plant materials should not be used for any temporary supports / scaffolding / preparing pre-assembly bed etc.
6.12	The details of equipments to be erected under this contract is generally as per the schedule given in relevant appendix of TCC. These details are approximate and meant only to give a general idea to the tenderer about the magnitude of the work involved. Actual quantum and type of equipments will be based on the erection documents which will be furnished in the course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.
6.13	Layout of field routed/ small bore (up to Nb100 max) piping shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of changes in routing the above pipelines even after completion of erection which shall be done by contractor as part of work.
6.14	Welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow metering & measurement devices and control valves to be provided in ACC & its auxiliaries and piping are covered within the scope of this specification. The installation of all the above items will be contractor's responsibility even if:
6.15	Items are not specifically indicated under the respective item-list as given in the technical specifications.
6.16	Items are supplied by any agency against P.O. issued by BHEL.
6.17	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. However ACC job contractor shall remain

	responsible for reconciliation of materials.
6.18	Actuators / drives of valves, dampers, gates, powered vanes etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.
6.19	Contractor should specifically have electrical and mechanical technicians for COMMISSIONING / servicing/ and maintenance of valves, actuators of Valves, Gates, Dampers and Strainers. The Technicians should have the expertise in dismantling the valves, Gates, Dampers, Actuators and their re-assembly and also attending to the problems. Contractor should also provide Electrical / Mechanical technicians for commissioning / servicing / Maintenance of erected equipment..
6.20	All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. Vendor shall all necessary MMDs including the motorized insulation testers for the above test.
6.21	In installation of various equipments it may become necessary to install these on temporary supports / hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions / hangers and later on shift the relevant equipments to their respective permanent hangers / suspensions / supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free – returnable basis. The same shall be returned to BHEL after the use.
6.22	Normally, the High Pressure Valves will have prepared edges for welding. But if it becomes necessary, the contractor will prepare new edges or re-condition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like T Pieces, weld neck flanges, reducers etc, shall be suitably matched with pipes for welding. The valves will have to be edge- matched, checked, cleaned and overhauled in full or in part before erection, after chemical cleaning and during commissioning, by the contractor as part of the scope of work.
6.23	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.
6.24	During hydraulic testing of the pipe system, all pressure parts having variable spring type supports shall be held securely in place by temporary means while constant spring type supports shall be pinned or blocked solid during test.
6.25	All the valves, dampers of ducts shall be serviced and lubricated to the satisfaction of BHEL Engineer, before erecting the same.
6.26	Deleted
6.27	All the wlding, bolt connection at terminal point of this contract with other contracts (i.e interfaces points) are to be done by the contractor within the quoted rate.
6.28	Instrument tapping coming on the Ducts to be welded/fitted on the Duct to be done by the contractor within the quoted price.
7.0	**SERVICES TO BE RENDERED BY THE BIDDER**
	Services for construction, fabrication, equipment erection, testing as well as trial run & commissioning of various equipment and accessories under the contract shall include but not be limited to the following:
7.1	Issuing materials from store/open yard as specified earlier from time to time for erection as per the construction programme. The contractor shall be the custodian of all the materials issued till the plant/equipment is officially taken over by the owner/ BHEL after complete erection any successful trial run & commissioning.
7.2	Transport of material to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
7.3	Trial run and commissioning of individual equipment/ sub-systems to the satisfaction of owner/ BHEL.

7.4	Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to the rendered under this specification.
7.5	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under scope of this specification except otherwise specified.
7.6	Supply of all consumables, eg welding electrodes, cleaning agents, diesel oil, lubricant etc as well as materials required for temporary supports, scaffolding etc as necessary for such erection work, unless specified otherwise.
7.7	Providing support services for the contractor's erection staff e.g., Construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials under the contractor's custody etc. as required.
7.8	Maintaining proper documentation of all site activities undertaken by the contractor as per the proforma mutually agreed with BHEL, submitting monthly progress reports as also any such document as & when desired by BHEL/ owner, taking approval of all statutory authorities, ie Boiler Inspector, Factory Inspector, Inspector of Explosives etc , as applicable, for respective portions of work under the jurisdiction of such statutes of laws.
7.9	All the materials issued to the bidder by BHEL shall be reconciled by the bidder and the unused materials have to be returned back to BHEL stores/yard or any other place as specified by BHEL.
7.10	After completion of the commissioning activity of equipment /systems, the contractor shall prepare the test Reports which shall include all the relevant information related to various commissioning checks, tests carried out, any deviations / commissioning noticed w.r.t. the intended design requirements, sequence of various commissioning activities as actually adopted vis-à-vis as recommended in the procedures, programme schedule achieved and any other such information as required .These Test Reports shall be submitted in requisite number of copies to BHEL/Owner /Contractor involved during the commissioning activities.
8.0	**SITE ORGANISATION**
8.1	The contractor shall provide adequate staffing in the following areas in addition to the staffing requirements of execution as instructed/informed by BHEL:
8.2	Overall planning, monitoring & control.
8.3	Quality control and quality assurance.
8.4	Materials management.
8.5	Safety, fire & security.
8.6	Industrial relations and fulfillment of labour laws and other statutory obligations.
8.7	The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organization shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organization shall be headed by a competent construction manager having sufficient authority to take decisions at site.
8.8	On award of contract, the contractor shall submit to BHEL site organization chart indicating the various levels of experts to be deployed on the job. BHEL reserves the right to reject or approve the list of personnel proposed by the Contractor. The persons, whose bio-data have been approved by BHEL, will have to be posted at site and deviations in this regard will not generally be permitted.
8.9	The contractor should also submit to BHEL for approval a list of construction equipment, erection tools, tackle etc prior to commencement of site activities. These tools & tackles shall not be removed from site without written permission of BHEL/CUSTOMER.
8.10	The organization chart for site should indicate the various levels of experts to be posted for supervision in the various fields in erection, commissioning etc as applicable. For proper supervision of the work, the contractor shall ensure providing one qualified supervisor against deployment of 15 workmen.
9.0	**ERECTION SCHEDULE**

	The contractor should also submit network programs for erection and commissioning of various items before start of work for approval of BHEL. These networks shall show customer/ BHEL's hold points (CHP), which have to be cleared by customer/ BHEL or their authorized representative(s) before further erection/ commissioning take place. These programs for the erection and commissioning would clearly identify responsibilities of the contractor and customer/ BHEL. Networks shall be submitted within 4 weeks of the date of LOI. The same shall be in commensuration with the project schedule mentioned in the tender.
10	**CONSTRUCTION MANAGEMENT**
10.1	Based on the PERT Network program, within 3 weeks of commencement of work, the Contractor shall submit a program of construction / erection / commissioning, for the implementation. This L2 network is to be submitted in Microsoft Project/PRIMAVERA PROJECT PLANNER in soft form within 3 weeks of start of work to Site In-Charge/Project Manager-Kolkata. These program would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring, The three monthly rolling program with the first month's program being tentative based on the site conditions would be prepared based on these program. The Contractor shall also be involved along with the Customer/BHEL to tie up detailed resource mobilisation plan over the period of time of the contract matching with the performance targets.
10.3	The program would be jointly finalised by the site in-charge of the contractor with BHEL/Customer's project coordinator as well as the site planning representative. The erection program will also identify the sequential erectable tonnages.
11	**PROJECT PROGRESS REVIEW MEETINGS**
11.1	Periodic progress reviews on the entire activities of execution in respect of supply & works in scope of bidder will be held once in a month at Kolkata/ site. These meetings will be attended by reasonably higher officials of the Contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. Actions will be placed on the concerned agencies and decisions will be taken to expedite/speed up the progress. Minutes of such meetings will be issued reflecting the major discussions and decisions taken and circulated to all concerned for reference and action. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
11.2	In addition to the above and to streamline the construction and erection at site a suitable frequency and forum of periodic meetings between the contractor and the Customer/BHEL will be decided upon as part of erection coordination procedure.
12.0	**CERTIFICATE TOWARDS COMPLETION**
	The work under the scope of the contractor will be deemed to be completed in all respects only when so certified by BHEL/NTPC. The decision of BHEL shall be final and binding on the contractor.
13.0	**CONTRACT EXTENSION**
13.1	If the completion of work as detailed in these specification gets delayed beyond the end of contract period then depending on the balance work left out, BHEL at its discretion may / may not extend the contract.
13.2	A joint program shall be drawn for the work to be completed during the extended contract period. Review of the program and record of shortfall as described earlier shall be done during the extended period.
13.3	The part of extension attributable to the contractor, if any, in total contract extension shall be exhausted first i.e., immediately after end of contract period. This shall be followed by the extension on account of force majeure conditions, if any, and lastly on account of BHEL.
13.4	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.
14.0	**PROTECTION**
14.1	Equipment having anti-friction or sleeve bearings shall be protected by weather tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces which are damaged shall be repainted.

14.2	Electrical equipments, controls and instrumentations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors.
14.3	All piping, tubing and conduit connections on equipment and equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or plugs or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.
14.4	All erected equipment/ components to be preserved as per the preservation recommendation of BHEL/NTPC. For this type of preservation, contractor shall engage an exclusive team of persons for meeting the continuous requirement. However, the required preservatives will be supplied to the contractor free of cost. All other consumables including wire brush, emery papers, painting brush etc to be supplied by the contractor within the quoted rate.
15	**ERECTION SERVICES**
15.1	As part of overall project management activity, the contractor shall be responsible for proper co-ordination of erection activities during various phases of execution of the contract. The contractor shall identify a person designated as construction manager, with whom BHEL shall interact on matters related to execution of the contract. The construction manager shall be the single point contract person on behalf of the contractor. BHEL shall interact with the construction manager only on all matters on co-ordination between BHEL and the contractor.
15.2	The contractor shall confine all his field operations to those works which can be reformed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms etc and during other unfavorable construction conditions. No field activities shall be performed by the contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the contractor in proper and satisfactory manner in the performance of such works and with the concurrence of the engineer. Such unfavorable construction conditions in no way relieve the contractor of his responsibility to perform the works as per the schedule. Contractor should maintain a hindrance register in proper form to keep records of date and time of the hindrance and produce as and when asked for.
15.3	The contractor shall supply all skilled workmen HP welders, gas cutters, electricians, riggers, sarangs, erectors, carpenters, fitters, masons, laggers, tin-smiths, instrument technicians, crane operators etc, in addition to other skilled, semi-skilled & unskilled workmen required for all the works of handling and transportation from site store to erection site, erection, testing and commissioning contemplated under this specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserve the right to decide on the suitability of the workers and the other personnel who will be employed by the contractor. BHEL reserve the right to insist on removal of any employee of the contractor at any time, if they find him unsuitable and the contractor shall forthwith remove him.
15.4	The supervisory staff employed by the contractor shall be technically qualified and experienced in the area of work. They shall ensure proper out turn of work and discipline on the part of labour put on the job by the contractor and in general see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL and BHEL's client/ consultant.
15.5	The contractor shall also furnish daily labour report showing by classification the number of employees engaged in various categories of work a progress report of work as required by BHEL Engineer.
15.6	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and

	his personnel shall co-operate with other personnel, and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
15.7	The contractor's supervisory staff shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. The contractor shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerance given in the drawing/ instruction given by BHEL/ALSTOM Engineer from time to time.
15.8	It is the responsibility of the contractor to engage his workman in shifts or on overtime basis for achieving the target set by BHEL during erection, commissioning and testing period. Contractor's quoted rate shall include all these contingencies.
15.9	For rendering commissioning assistance during running of the unit till handing over of the set, a dedicated gang along with an exclusive supervisor, need to be deployed by the contractor to attend the incidental works of commissioning as per the instruction of BHEL commissioning engineer. The gang need to be provided during night shift also whenever required by BHEL commissioning engineer. They shall be equipped with all necessary hand-tools to attend all the incidental works during commissioning.
16.0	**DEWATERING**
	Contractor shall ensure at all times that his work area & approach/access roads are free from accumulation of water, so that the materials are safe and the erection/progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchment water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.
17.0	**HEALTH, SAFETY & ENVIRONMENT (HSE)**
17.1	Vendor has to follow HSE norms at project site during execution of entire contract period and the applicable HSE norms are noted in Tender document for HSE norms having Document Title: Health, Safety and Environment Plan for Site Operation by Subcontractors
17.2	Deployment of HSE personnel(s) as per guideline of the Document (Document Title: Health, Safety and Environment Plan for Site Operation by Subcontractor) is mandatory requirement at site. Any dilution in deployment of HSE personnel(s) will attract penal deductions from the vendor's RA bills and in this regard decision of BHEL Site- Construction Manager shall be final and binding on the contractor
18.0	**QUALITY ASSURANCE PROGRAMME**
	The bidder shall adopt suitable quality assurance programme to control activities as necessary, Such programme shall be outlined by the bidder and shall be finally accepted by BHEL/ owner/ authorised representative. Bidder's quality assurance programme shall generally cover the following.
18.1	The organisation structure & qualification data of key personnel for management and implementation of the proposed quality assurance programme.
18.2	System for site erection control including process controls and fabrication and assembly controls.
18.3	Control of non-conforming items and system for corrective actions.
18.4	Inspection and test procedure for all site related works.
18.5	Control of calibration and testing of measuring and testing equipment.
18.6	System for quality audit.
18.7	System for indication and appraisal of inspection status.
18.8	System for maintenance of records.
19.0	**GENERAL REQUIREMENTS - QUALITY ASSURANCE**
19.1	All materials, components and equipment covered under this specification shall be erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme of BHEL.
19.2	Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc to be followed by the bidder site quality control organisation, during various stages of site activities from receipt of materials/equipment at site.

19.3	Quality audit/ approval of the results of tests and inspection will not prejudice the right of BHEL to reject equipment, not giving the desired performance after erection and shall not in any way limit the liabilities and responsibilities of the Bidder in earning satisfactory performance of equipment as per specification.
19.4	Repair/ rectification procedures to be adopted to make any job acceptable shall be subject to the approval of BHEL/ owner.
20.0	**QUALITY CONTROL & QUALITY ASSURANCE**
20.1	Bidder shall deploy adequate FQA/QC Engineer at project site as required by BHEL. The quality assurance engineer shall coordinate all aspects of quality control, inspection, implementation of quality assurance procedures laid down in quality plan and technical specification by BHEL. He shall fill-up quality assurance log sheets/ formats and submit to BHEL for joint inspection & acceptance.
20.2	FQA Engineers shall be deployed only after review and acceptance of their credentials by BHEL/Customer. For this purpose, bidder shall provide to BHEL the C.V of the engineers to be deployed. The C.V shall include the educational / professional qualification, detailed experience and achievements of the engineers.
20.3	Deployment of following FQA Engineers have been envisaged :
	For Mechanical works – 1 Nos.
	For Equipment testing – 1 No.
20.4	The performance of deployed engineers shall be reviewed jointly by BHEL and Customer on quarterly basis and in case of deficiencies in performance, corrective action shall be taken by BHEL which can be either deployment of substitute engineers by the bidder or deployment of FQA engineers through outsourcing. In case of sourcing FQA engineers from other agency, cost of deploying the engineers will be recovered from bidder's dues.
21.0	**FACILITIES TO BE PROVIDED BY BHEL/ CUSTOMER**
21.1	LAND
21.1.1	Graded / Levelled area shall be handed over to the contractor at site for construction of site office.
21.1.2	The successful bidder shall furnish the estimated area showing layout plan/ sketch required for the construction of his office, stores (covered, semi-covered and open), fabrication yard etc. The same will be reviewed by BHEL and allotted to the extent available/ considered necessary, depending upon the area availability. The sketch/ layout plan for labour colony shall include overhead drinking water line, electric power, sewage/ sanitary system. Bidder should construct temp CGI shed with brick wall with IPS floor etc.
21.1.3	Minimum land will be provided free of cost for construction of temporary office, stores etc.
21.1.4	Land may be provided for labour colony outside the project premises on availability from Customer. The contractor is expected to construct labour colony/ hutment after obtaining all necessary statutory clearances meeting minimum HSE standard including proper drinking water and sanitation facility.
21.1.5	The contractor will be responsible for handing back all lands, as handed over to him for his temporary use to BHEL, as per the instruction of BHEL engineer.
21.2	**WATER**
21.2.1	Contractor shall make all arrangements himself for the supply of potable water for labour and other personnel at the worksite/ colony. For construction purpose, BHEL shall provide water at a single point. Contractor to make necessary arrangement for drawing construction water from that point.
21.2.2	BHEL shall not be responsible for any inconvenience or delay caused due to non-availability of water supply and the contractor shall claim no compensation on account of this.
21.3	**ELECTRICITY**
21.3.1	BHEL will provide construction power on free of charge basis at LT voltage level at two/three points within project premise as close as possible to the working locations. Further distribution (including laying of cables/ installation of DBs and maintenance of the same) beyond this point to be arranged by the contractor at his own cost. For drawing Power, distribution Board need to be installed by Vendor within his quoted Price. The Boards should

	have provision of Over Current and Earth Leakage protection so that any disturbance in the area of vendor do not affect the supply at Upstream / Customer end. The Distribution Board should consist of suitable Current rating TPN Aluminium Busbar and necessarily fitted with 400 Amps 4P 50 Ka MCCB with CBCT and ELR. The Board should be fitted with Ammeter (0-800 Amps) and Voltmeter (0 – 600 Volt). Outgoing Feeders should be fitted with 400 A / 250 A / 100 Amps MCCBs. These Distribution Board need to be installed by vendor only after getting the same inspected and cleared by BHEL / Customer. The Power Distribution board installed by vendor shall remain the property of Vendor and they will take it out on completion of job. Any other voltage as required shall be arranged by the contractor from power supply as above. Contractor will have to provide necessary calibrated meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized/ accredited agency for working out power consumption at his own cost. In case of recalibration required for any reason necessary charges including replacement by calibrated meters is to be borne by the contractor. Supply of electricity shall be governed by Indian Electricity Act and Installation Rules and other rules & regulation as applicable. The contractor shall ensure usage of electricity in an efficient manner and the same may be audited by BHEL time to time. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases.
21.3.2	The bidder shall have to provide earth leakage breaker at each point wherever human operated electrical drives/ T&Ps are deployed.
21.3.3	The power supply will be from the available grid. BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply and no compensation for delay in work can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.
21.3.4	The contractor should ensure that the work in critical areas is not held up in the event of power breakdown (especially during slip-from concreting), and shall make all necessary arrangements for uninterrupted supply, at his cost. As a part of the bid, a specific proposal in this regard has to be submitted by the contractor. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the responsibility of the contractor to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.
21.3.5	The contractor shall have to make arrangement at their own cost for illumination that will be required in the working area for execution of the work & safety of workmen.
21.3.6	Bidders have to make their make arrangement for electricity at their own cost for labour colony. Power drawn for Labour colony will be chargeable and the rate shall be same as charged by NTPC for providing Power. Required metering facility need to installed by the vendor at his own cost and only after due inspection of the installed facility by the engineers of both BHEL and NTPC Power supply can be arranged.
22.0	**FACILITIES TO BE PROVIDED BY THE CONTRACTOR**
22.1	All tools and tackles, machinery, equipment, instruments required for the work have to be arranged by the contractor including its transportation before and after work and including storage, insurance etc.
22.2	The contractor shall provide all required tools and plants, inspection, measuring and test equipment and handling & transportation equipment for the scope of work covered under these specifications. Some of the major T&Ps to be necessarily provided by the contractor is listed in relevant appendix of this tender. BHEL will provide the services of their T&Ps listed vide appendix-II, free of charge, on sharing basis.
22.3	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.
22.4	Contractor shall provide all the necessary scaffolding materials, temporary structures, as may be required and necessary safety devices etc.
22.5	Contractor’s responsibilities with regard to operator, fuel, lubricants and daily upkeep of T & P s provided by BHEL is further detailed in relevant section.
22.6	Timely deployment of adequate quantity of T&P is the responsibility of the contractor. The

	contractor shall be prepared to augment the T & P at short notice to match the planned program and to achieve the milestones.
22.7	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.
22.8	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.
22.9	The T & P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. The movements 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.
22.10	The contractor shall arrange adequate nos. of wooden sleepers /steel plates for compaction of approach for crane movement and material stacking near work site failing which BHEL may get the same done at their risk & cost.
22.11	For welding, use of welding generators/ rectifiers only is permitted.
22.12	The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of measuring instruments (MMDs) and tests. Fitness certificate for the Cranes, Lifting Slings, Winches and other T&Ps need to be submitted in the prescribed format as per BOCW Act. For this, certification to be obtained from authorized representative as stated in the BOCW act. Test/ calibration certificates shall be furnished to BHEL. MMDs shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL.
22.13	**SITE/ FIELD OFFICE AND STORES**
22.13.1	The contractor shall make his own arrangements for Site /field office and stores for accommodating necessary equipments, tools room for execution of the work. Only open space will be provided by BHEL / customer, free of charges within the project premises as per the availability of space.
22.13.2	On completion of work, all the temporary buildings, structures, pipelines, cables, etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so , the same will be arranged to be removed and expenditure thereof will be recovered from the contractor. The decision of BHEL engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.
22.14	**AREA LIGHTING**
	Contractor shall arrange adequate floodlights, hand lamps and area lighting. Provision of distribution lines for lighting from the single point to the required place with proper distribution boards, observing the safety rules laid down by the electrical authorities of the state shall be done by the contractor. Contractor shall use his own materials like cables, fuses, switchboards etc.
23.0	**RESPONSIBILITIES WITH REGARD TO EMPLOYMENT OF LABOUR ETC**
23.1	Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.
	BHEL / customer may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL / Customer.
23.2	It is the responsibility of the contractor to arrange gate pass for all his employees, T & P etc. for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.
23.3	If at any time during the execution of work, it is noticed that the work is suffering on account

	of non-availability/shortfall in provision of resources from the contractor's side BHEL will make suitable alternate arrangements at the risk and cost of contractor. The expenditure incurred with overheads thereby shall be recovered from the contractor.
23.4	The contractor shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him. Contractor should furnish a tentative deployment plan of his manpower as required in GCC. Also the actual deployment will be so as to satisfy the erection and commissioning targets set by BHEL.
23.5	It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL 's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to set the erection and commissioning targets will be final and binding on the contractor.
23.6	Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.
23.7	The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.
23.8	The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL 's client.
23.9	If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost.
24.0	**TOOLS, TACKLES**
	The contractor shall provide all construction equipments, tools, tackles, scaffoldings etc required for civil works, pre-assembly, erection, testing and commissioning of the equipments covered under the contract. He shall submit a list of all such materials to BHEL/ customer before the commencement of pre-assembly at site. These tools & tackles shall not be removed from the site without the written permission of BHEL/ customer. The T&Ps to be arranged by the contractor shall be in proper working condition and should bear valid certification from the Statutory authority on its fitness for use.
25.0	**COMMUNICATION**
	The contractor shall be responsible for arranging all communication facilities for himself at site. The contractor has to establish independent internet/ e-mail facilities with mobile connection for all key site personnel and same shall have to be integrated with BHEL's voice/ data network and database systems at site.
26.0	**FIRST-AID**
	The contractor shall provide necessary first-aid medical facilities for all his employees, representatives and workmen working at site. Enough number of contractor's personnel shall be trained in administering first-aid.
26.1	Deleted
27.0	**HOUSEKEEPING**
27.1	The contractor shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris etc. during the period of contract. The contractor shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish and scrap material shall be stacked or disposed in a place to be identified by BHEL/ customer. Materials and stores shall be so arranged to permit easy cleaning of the area. In areas where equipment might drip oil and cause damage to the floor surface, a

	suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect the floor from such damage.	
27.2	Similarly the labor colony, the offices and the residential areas of the contractor's employees and workmen shall be kept clean and neat to the entire satisfaction of BHEL/ customer. Proper sanitary arrangements shall be provided by the contractor, in the work-areas, office and residential areas of the contractor.	
27.3	Bidders to note that following.	
27.4	One no experienced paramedical personnel with first aid facility at site is a must. No medical facility within/ near the site shall be provided by BHEL.	
27.5	No staff quarter shall be provided by BHEL.	
27.6	All site execution approaches required for movement of cranes, trailers, trucks, dumpers, etc shall be arranged by the contractor at his own cost.	
27.7	The contractor shall solely be responsible for the safety, quality & quantity of material after it is handed over and issued to contractor by the BHEL.	
28.0	**PROJECT MANAGEMENT**	
28.1	The bidder shall prepare detail schedule L1/ (L-2) and submit within 30-days of LOI for BHEL approval, as per MILESTONE completion schedule given in this document. This schedule must include all milestone and key activities for each package/ subsystems/ components in his scope of work in the areas of mobilization, procurement, inspection, despatch, erection/ commissioning/ handing over of the aforesaid work.	
28.2	The contractor shall furnish an offer stage master network/ bar chart (L1 schedule) in accordance with the project milestone schedule. The contract master bar chart will be negotiated with the successful bidder.	
28.3	The successful contractor shall prepare and maintain the detailed master schedule (L2 network) during the course of the work.	
28.4	Theses network must conform to the overall requirement of the project schedule as detailed below. The bidder should also ensure monitoring of these activities at least on weekly basis to start with and on daily basis whenever required by BHEL.	
28.5	**Project milestones of unit # 3**	
	Milestone	Schedule
28.5.1	Mobilization	Within 15 days from the date of intimation by BHEL.
28.5.2	Air Leak Teat of Overall ACC system	11th Month from start of Erection
28.5.3	Overall Flushing through Steam Dumping of ACC	13th month from start of erection.
28.5.4	Readiness of ACC Unit # 3	14th month from start of erection.
28.5.5	Work Completion of ACC Unit # 3	15th month from start of erection.
29.0	**COMPUTER INFRASTRUCTURE**	
	The successful bidder will have to establish computerized project management system and the install adequate nos. of latest computer facility for his own usage at site.	
29.1	Additionally, The bidder will have to install 2 no. PCs (multimedia PC work station Pentium-core-2 Duo, 1 GHZ or above, 500 GB HDD, 4 GB RAM, 100/1000 MBPS LAN card) of HCL/ COMPAQ/ ZENITH or equivalent make with window 7 or XP (professional) O/S and required software like MS Office 2007 Professional, AutoCAD 2009 or higher, PageMaker (7.0 etc), ADOBE PDF CREATOR with one no laser jet printer compatible for A3 size printing (ink/ cartridge for which to be supplied as and when required), one no laser jet printer compatible for A4 size printing (ink/ cartridge for which to be supplied as and when required) with power backup at places, as per instruction of BHEL for exclusive use of BHEL. These computers/ printers shall remain contractor's property and they will be allowed to take out the same after completion of original contract period. The contractor shall provide data / information etc in prescribed formats for periodical updating of the progress reports, material management reports, updating of network pertaining to the contractor's scope of work etc. The contractor shall also provide two (2) number computer operators and two (2) number service staffs for miscellaneous service for BHEL's use at site/ Kolkata for reconciliation, progress review & day-to-day planning purpose, documentation etc. These facilities are to be provided within 30 days from LOI date till completion of scheduled contract period. If	

	contractor fails to provide computer/ printer or personnel as per requirement, for a continuous period of fifteen days or more, BHEL shall have the right to deduct the amount as per following rates on prorate basis, from contractor's RA bill or any other dues.
29.2	@ Rs 15,000/- (Fifteen thousand)/ month for each computer operator. Or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.
29.3	@ Rs 15,000/- (Fifteen thousand) / month for each service staff. Or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.
29.4	@ Rs 12,000/- (Twelve thousand) / month for each set of computer & printer. Or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.
29.5	In the event of the contract period getting extended beyond the stipulated time for reasons not attributable to you, you will be reimbursed at the above mentioned rate or (actual +15%), whichever is lower, if the services of operator / service staff are used by BHEL during the extended period.
30.0	**GENERAL**
30.1	The contractor shall be responsible for planning and scheduling the work and reporting its progress in a manner, format and level of detail acceptable to BHEL. These plans shall be in accordance with the intermediate milestones and the completion dates as specified by and agreed in the contract.
30.2	The contractor shall be responsible for reporting progress to purchaser on a weekly and monthly basis. Progress reports shall be presented in a clear and logical fashion preferably through a software disc and in PDS format mutually agreed between BHEL and contractor.
31.0	**DETAILED MASTER SCHEDULE (L2 NETWORK)**
31.1	Within 21 days of start of work, contractor shall submit to purchaser the detailed master schedule (L2 schedule) for approval. L2 schedule shall be the working level document demonstrating contractor's ability and methods of completing the work within the key milestones identified in the tender specification.
31.2	The Schedule shall be based on a computerized logic network. The level of detail shall be sufficient to break down the work scope into manageable and measurable activities acceptable to Purchaser. All activities shall have durations in days.
31.3	The contractor shall provide a detailed activity bar chart based on the resource scheduled logic network. The bar chart shall contain activity descriptions, planned start and finish dates with the critical path activities clearly identified. The network / bar chart shall be updated weekly to indicate actual progress.
31.4	In addition contractor shall furnish percentage - based progress 'S' curve indicating, the required rate of progress necessary to complete the work according to the CMS. The 'S' curve shall be updated weekly to plot actual progress against planned.
32.0	**PROGRESS MEASUREMENT AND MONITORING**
32.1	The contractor shall measure progress of the work using its own methods and procedures preferably in primavera.
32.2	Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed and action to be taken for achieving targets will be decided. For discussions, the contractor shall present program of subsequent week. The contractor shall constantly update/revise his work program to meet the overall requirement.
32.3	Periodic progress reviews on the entire activities of execution in respect of engineering, quality, procurement, supply and works in scope of bidder will be held once in a month at Kolkata/ site/ contractor's premise/ BHEL/ or any other convenient premise. These meetings will be attended by reasonably higher officials of the contractor along with its sub-contractors & consultant as applicable and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided in such meetings.
32.4	Contractor shall identify separate Construction Manager, Engineering Manager, Quality Manager and selection of various Key personnel shall be subject to BHEL approval.
33.0	**PERFORMANCE REPORTING**
33.1	The contractor shall submit weekly progress reports to purchaser in the agreed formats

	submitted in adequate number of signed originals. The report shall include following.
33.2	Brief narrative of work performed during the week.
33.3	Updated progress 'S' curves showing actual progress.
33.4	Milestones achieved and new activities started.
33.5	Status of critical activities.
33.6	The contractor shall submit monthly progress reports to purchaser in the agreed formats submitted in adequate number of signed originals. The report shall include the weekly report content and shall be supplemented with the following.
33.7	Consumable Procurement status.
33.8	T&P deployment status.
33.9	Erection & commissioning status .
33.10	Safety report.
33.11	Updated L2 schedule indicating status.
33.12	Executive summary, areas of concern etc.
33.13	Manpower deployment status
33.14	Compliance of statutory rules/regulations
33.15	Progress photographs.
33.16	SUBMISSION OF PERIODICAL REPORTS
33.17	Contractor shall submit periodical reports in respect of following aspects of operation.
33.18	Consumption of consumables like welding electrodes, gases and paints.
33.19	Consumption of construction power
33.20	Availability and utilization of BHEL ’s tools & plants
33.21	Availability and utilization of contractor’s tools & plants
33.22	Daily manpower reports
33.23	Daily progress reports of activities & incidents
33.24	Test calibration reports
33.25	Records of wages , EPF payment.
33.26	BHEL/ client may specify any other report/record as required.
33.27	Record of protocol/ logsheet
33.28	Adequate numbers of color photographs (post card size for each area per month of the contract execution period), depicting progress of the work or damage to the machine parts, if any, as directed by BHEL site engineer is to be arranged by the successful bidder at his own cost.
33.29	The progress report shall be compiled in computer and is required to be furnished over “E Mail, in addition to hard copies and summary report shall be made ‘Web enabled’ in agreed format.
34.0	**CONSUMABLE**
34.1	All consumables, like gas, electrodes, chemicals, lubricants etc required for the job shall be arranged by the contractor at his cost unless otherwise specifically mentioned in the contract.
34.2	All consumables to be used for the job shall be approved by BHEL prior to use.
34.3	In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along-with overhead shall be paid by the contractor or deducted from the contractor’s bills.
35.0	**MMD**
	The contractor shall ensure deployment of reliable & calibrated instrument, measuring and test equipments (MMD). The MMD shall have test/ calibration certificate from authorised/ Govt approved agencies. The contractor shall also keep provision of alternate arrangement for such MMD so that the work does not suffer when a particular MMD is sent for calibration. Re-testing/ re-calibration shall also be arranged by the contractor at their own cost at regular interval during the period of use as advised by BHEL.
36.0	**CRANES AND T&Ps TO BE PROVIDED BY BHEL**
36.1	BHEL will make available the crane (as per relevant appendix of this tender) with fuel and operators free of charges as applicable, to the contractor on sharing basis mainly for the

	purpose of pre-assembly and erection of components. The Crane shall be available for (14) fourteen hours inclusive of one-hour lunch break daily, excluding Sundays and scheduled Holidays. For Crane working beyond normal working hours or on Sundays /Holidays, prior permission of the BHEL Site In-charge/ Construction Manager is to be obtained. However, BHEL Site In-charge/ Construction Manager's decision in this regard will be final after judging the proficiency of the contractor's crane requirement.
36.2	These cranes have to be shared with other agencies/ contractors of BHEL. The allocation of cranes shall be the discretion of BHEL Site In-charge/ Construction Manager, which shall be binding on the contractor.
36.3	All arrangements, including providing & laying of sleeper beds, back-filling of approaches wherever necessary for safe movement of the cranes as directed by BHEL shall be the responsibility of the contractor. The contractor shall provide sleepers for this purpose at his cost.
36.4	Any boom reduction, extension for their use and restoration to previous state or as directed by BHEL after the use shall be the contractor's responsibility and to be done with contractor's own T&P, cranes, consumables and manpower.
36.5	For unloading/loading of BHEL Cranes during mobilization / demobilization process, assistance in the form of manpower, hand tools, hydra along with operator, fuel, may be required. On necessity, vendor shall render this assistance within his quoted price. However, if Heavy Crane facility is required in the process, BHEL shall issue their available crane free of any charges. For loading, unloading, installation, commissioning, dismantling, shifting of BHEL deployed Tower cranes, vendor shall render assistance in the form of manpower, hand tools, hydra along with operator & fuel etc. within his quoted price. However, if Heavy Crane facility is required in the process, BHEL shall issue their available crane free of any charges.
36.6	Major breakdowns will be attended by BHEL. The cranes provided by BHEL will be withdrawn for regular and capital maintenance as per the respective schedule of maintenance. As far as possible such schedules will be intimated to the contractor in advance and may be adjusted depending on the work requirements at site. However no claim whatsoever will be entertained on account of non-availability of cranes.
36.7	Where the services of the cranes provided by BHEL are to be shared by other agencies/ contractors of BHEL, the contractor's responsibilities defined above will also be apportioned accordingly to the beneficiary agency. BHEL engineer will do working arrangements in this regard at site and in any case his decision shall be final and binding.
36.8	The machineries as prescribed in relevant annexure will be provided to contractor on free of cost basis on availability. The list is only indicative and BHEL shall provide these subject to availability. The cranes will be provided to contractor with fuel and operator on sharing and free of any hire charges basis.
36.8	Loading of materials at BHEL stores shall be done by the contractor using his cranes.
37.0	**OTHER T & Ps**
37.1	The responsibilities of contractor defined above for BHEL cranes shall also be applicable, mutatis – mutandis, in respect of other tool & plants provided by BHEL.
37.2	Special tools which are supplied as part of maintenance tools to be handed over to customer may be issued to the contractor free of charges for specific activities, at the discretion of BHEL free of charges. Contractor shall return them after the completion of the specific activity for which the tools were spared, in good working order.
37.3	BHEL shall provide one (1) passenger elevator, for U#3 of ACC, free of any charges. Erection , commissioning , day to day maintenance of the Elevator shall be in the scope of the vendor. In the event vendor is not able to erect and commission the elevator, they may take the help of original equipment manufacturer details of which may be obtained from BHEL. Day to day maintenance of the elevator will be in the scope of the vendor. Statutory Load Testing of the installed Elevator through accredited agency who are authorized to issue such kind of certificates shall also be in the scope of vendor within the quoted price. Throughout the entire period of job execution, the agency requires to maintain live

	certificate of "Elevator Fitness" issued by the authorized agency as per Statutory norms. .
37.4	Lubricants like engine oil, cardium compound, hydraulic oil, gear oil, grease for BHEL's T&Ps including cranes will be provided by BHEL free of charge. Similarly filters for cranes will be provided free of charge by BHEL.
37.5	The contractor must not use these equipments for any purpose other than what they are intended for.
37.6	If the above items issued to contractor are found not utilised/ not maintained to the satisfaction of BHEL engineer or misused, these will be withdrawn and no replacement will be done for such items.
38.0	**TEST CERTIFICATE FOR T&P**
38.1	All T&P, lifting tackles and pulling devices to be deployed by the contractor must bear valid/ latest test certificates issued by of authorized signatory of statutory bodies for their suitability and the documents shall be preserved at site.
38.2	In case of expiry of validity of any such test certificate during construction, the contractor shall arrange for revalidation of the same well in advance, so that the construction activities do not suffer on account of non-availability of such Test certificates.
38.3	The contractor should also submit to BHEL for approval a list of T&Ps along with their fitness certificates. The tools & tackles shall not be removed from site without written permission of BHEL.
39.0	**ISSUE OF T&Ps**
39.1	Deployment of all T&Ps for this tender shall be contractor's responsibility. However, if BHEL issues any T&Ps (other than mentioned free of cost T&Ps) the same shall be on chargeable basis as per BHEL norms unless otherwise specified.
39.2	In the event of BHEL issued T&Ps, measuring instruments etc, contractor and BHEL shall maintain joint protocol about the condition of all T&P, instruments etc taken from BHEL's custody and return to BHEL after use. The contractor shall not use these equipment for purposes other than the scope of work given in this tender document.
39.3	It is the responsibility of contractor to keep these equipments always in working condition and ensure their safe return in working condition to BHEL's store subject to normal wear & tear.
39.4	After use of T&P items issued by BHEL the same shall be returned to BHEL in good working condition subject to normal wear & tear failing which recoveries at the book value of the item or the market rate prevailing at the time of returning the items, whichever is higher shall be made from the payments due to the contractor from BHEL from this contract or from any other contract.
40.0	**AREA REQUIREMENT**
	The contractor shall furnish the estimated area required for the construction of his office, stores, etc separately. The same will be reviewed by BHEL and allotted to the extent available/ considered necessary, depending upon the area availability.
41.0	**CONSTRUCTION OF TEMPORARY OFFICE, STORES ETC**
	The contractor shall arrange at his own cost the construction of his temporary office, stores, fabrication yards, labour colony etc and also the watch & ward of all above.
42.0	**RECONCILIATION OF MATERIALS**
42.1	Contractor shall submit a reconciliation statement of material after completion of job.
42.2	The contractor shall return the unused plant materials under their custody to BHEL's store/ yard at their own cost.
43.0	**SECURITY DEPOSIT (SD) AND PERFORMANCE BOND (PB)**
43.1	Security deposit shall be as per respective clauses of GCC.
43.2	Performance bond is not applicable.
44.0	**INSURANCE**
44.1	BHEL shall arrange comprehensive MCE (marine cum erection) Insurance Policy for total project supply & services including balance of plant package covering transit risks & loss, destruction or damage during handling at Site, Storage, civil works ,erection, testing and commissioning up to trial operation completion of each unit including theft, sabotage, fire,

	lightning and other natural calamities.
44.2	The contractor will take necessary precautions/ due care to protect the material at Project site, while in his custody from any damage/ loss till the same is handed over to BHEL/ customer at Project site. For lodging/ processing of insurance claim the contractor will submit necessary documents. BHEL will reserve the right to recover the loss from the contractor as detailed below in case the damage/loss is due to negligence/ carelessness on the part of the contractor. In case of theft of material under contractor's custody, the same shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL/ customer for taking up with insurance. However, this will not relieve the contractor of his contractual obligation for the materials in his custody.
44.3	In case the damage/loss/theft of materials are attributable to negligence/failure in discharging the duties and obligations of the contractor, the expenses incurred for repair/replacement of such components in excess of the amount realized from the underwriters, limited to Normal Excess (Deductible Franchise) shall be recovered from the contractor.
44.4	In case the claim is summarily rejected by the underwriters due to WILFUL NEGLIGENCE of the contractor, the entire cost of repair/replacement will be recovered from the contractor.
44.5	Other conditions of Insurance shall be as per relevant clause of GCC.
45.0	**REPORTING DAMAGES AND CARRYING OUT REPAIRS**
45.1	Checking all components / equipments at siding /site and reporting to transport and / or insurance authorities of any damages / losses will be in the scope of contractor. Necessary assistance for verification / survey and lodging claims with underwriters and follow up to logical conclusion will also be part of this contract.
45.2	Contractor shall render all help to BHEL in inspection including handling, opening packages, re-packing, re-stacking etc., assessing and preparing estimates for repairs of components damaged during transit, storage and erection, commissioning and preparing estimates for fabrication of materials lost / damaged during transit, storage and erection. Contractor shall help BHEL to furnish all the data required by railways, insurance company or their surveyors.
45.3	Contractor, shall report to BHEL in writing any lost/damages to equipments / components during drawl of the materials from stores, in transit to site and unloading at a place of work and during erection and commissioning. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of noncompliance of this stipulation will be borne by contractor.
45.4	Contractor shall carry out fabrication of any material lost /damages as per Instructions from BHEL Engineer.
45.5	BHEL, however, retains the right to award or not to award to the contractor any of the rectification / rework / repairs of damages and also fabrication of components.
45.6	All the repairs / rectification / rework of damages and fabrication of materials lost, if any, shall be carried out by a separately identifiable gang for certification of man-hours. Daily log sheets should be maintained for each work separately and should be signed by contractor's representative and BHEL Engineer. Signing of log sheets does not necessarily mean the acceptance of these as extra works for payment purpose.
45.7	All rectification, repairs, reworks and fabrication of components lost, which are minor and incidental to erection work (consuming up to 50 man-hours on each occasion) shall be treated as part of work without any extra cost.
45.8	Insurance cover under this policy will be as per clauses 26.0 to 26.4 of general conditions of contract.
45.9	In case the repairs / rectification / rework and fabrication of materials lost, the work has been done by more than one agency including the contractor, the payment towards extra charges will be on prorata basis and the decision of BHEL in this regard is final and binding on the contractor.
46.0	**COMPLETION PERIOD**
46.1	The entire work of erection, testing and commissioning, up to handing over of unit shall be

	completed within a period of 15 months (Fifteen months) from the date of start of work for Unit#3.
46.2	The bidder shall arrange to mobilise and start the erection work within 15 days from the date of intimation by BHEL.
46.3	The actual date of start of work of Unit#3 will be certified by BHEL site in-charge/CM after adequate mobilisation of manpower, T&P by the contractor. This certificate date will be deemed as start of work of the Unit#3 at site for purpose of the contract time schedule.
46.4	The work under the scope of contract will be deemed to be completed in all respects only when all the components are erected and trial runs, testing and commissioning of all individual equipment including trial operations of the unit with full load are conducted and handed over to customer. The decision of BHEL shall be final and binding on the bidder.
47.0	**CONSTRUCTION SCHEDULE**
47.1	Bidder shall plan activities accordingly to match the milestone schedule enumerated in the tender. However, the stated schedule is indicative and actual milestones shall be finalized during execution at site depending on project's requirement.
47.2	A bar chart showing of various milestones to be submitted by the bidder within one month from date of LOI to Construction Manager, BHEL site for approval.
48.0	**TAXES AND DUTIES**
48.1	All taxes excluding GST & BOCW Cess (as specified elsewhere in the tender) but including, Charges, Royalties, any State or Central Levy and other taxes for materials if any obtained for the work and for execution of the contract shall be borne by successful bidder and shall not be payable extra by BHEL. Any increase of above at any stage during execution of contract, including extension of the contract, shall have to be borne by successful bidder contractor. Bidder's quoted/ accepted rates/ price shall be inclusive of all such requirements.
48.2	GST along with Cess (as applicable) legally leviable & payable by successful bidder as per GST Law, shall be paid by BHEL, extra. Hence, bidder shall not include GST along with Cess (as applicable) in their quoted rates/ price.
48.3	Successful bidder shall furnish proof of GST registration with GSTN Portal covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by successful bidder on BHEL for this project/ work.
48.4	Since GST on output will be paid by BHEL separately as enumerated above, bidder's your quoted rates/ price should be after considering the Input Credit under GST law at bidder's end.
48.5	TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills (RA bills) unless exemption certificate from the appropriate authority/ authorities is furnished.
48.6	**TDS under GST shall be deducted at applicable rates on gross invoice value from the running bills (RA bills).**
48.7	Bidder shall note that GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred thereunder) wherein the 'Bill To' details shall encompass following. BHEL GSTN: 20AAACB4146P5ZP. Name: Bharat Heavy Electricals Ltd. Address: Shall be intimated later. Any change to above shall be notified by BHEL at appropriate juncture..
48.8	Successful bidder to intimate immediately on the day of removal of goods (in case of any supply of goods) to BHEL along with all relevant details and send a scanned copy of Tax Invoice to BHEL through following communication mode for enabling BHEL to meet its GST related compliances.

	Portal address. Shall be intimated later. and Email address – Shall be intimated later. Specific details of above shall be notified by BHEL at appropriate juncture.
48.9	In case of delay in submission of above mentioned documents on the date of despatch, BHEL may incur penalty/ interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from successful bidder, in case such delay is not attributable to BHEL.
48.10	In case of raising any Supplementary Tax Invoice (Debit/ Credit Note), successful bidder shall issue the same containing all the details as referred to in Section 34 read with Section 31 of GST Act & Rules referred there under.
48.11	Successful bidder shall comply with the Time Limit prescribed under the GST Law and rules thereof for raising of the Tax Invoice. If any supply of goods is applicable, successful bidder shall also ensure prompt delivery of goods after despatch.
48.12	Bidder shall note that in case GST credit is delayed/ denied to BHEL due to delayed/ non receipt of goods and/ or Tax Invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons, not attributable to BHEL, GST amount shall be recoverable from successful bidder along with interest levied/ leviable on BHEL, as the case may be.
48.13	Successful bidder shall upload the invoices raised on BHEL in GSTR-1 within the prescribed time as given in the GST Act. Bidder shall note that in case of delay in declaring such invoice in your return and GST credit availed by BHEL is denied or reversed subsequently as per GST Law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from the successful bidder along with interest levied/ leviable on BHEL.
48.14	Way Bill: Successful bidder to arrange for way bill/ e-waybill for any transfer of goods for the execution of the contract. Successful bidder has to make their own arrangement at their cost for completing the formalities, if required, with Issuing Authorities, for bringing materials, plants & machinery at site for execution of the works under this contract, Road Permit/ Way Bill, if required, shall be arranged by successful bidder and BHEL will not supply any Road Permit/ Way Bill for this purpose.
48.15	Any new taxes & duties, if imposed subsequent to due date of offer submission as per NIT & TCN, by statutory authority during contract period (including extension, if the same is not attributable to you), shall be reimbursed by BHEL on production of relevant supporting document to the satisfaction of BHEL. However, you shall obtain prior approval from BHEL before depositing new taxes and duties.
48.16	Benefits and/ or abolition of all existing taxes must be passed on to BHEL against new taxes, if any, proposed to be introduced at a later date.
49.0	**PRICE VARIATION COMPENSATION (PVC)**
	Price variation (PVC) shall be applicable as per GCC.
50.0	**ORC (OVER RUN COMPENSATION)**
	ORC Shall be applicable as per GCC.
51.0	**TERMS OF PAYMENT**
51.1	Successful bidder shall submit their running bill (RA bill) once in a month, at the end of the month, as per billing break-up, based on rate schedule.
51.2	Progressive payment shall be made by BHEL against successful bidder's RA bill. Contractor's RA bill with all supporting documents, complete & correct in all respects, certified by BHEL engineer, shall be paid after 60 days of receipt of bill.
51.3	Measurement will be taken as specified in terms & conditions of the contract and certified by BHEL engineer of actual work.
51.4	Subject to any deduction which BHEL may be authorized to make under the contract, successful bidder shall on the certification of BHEL engineer at site, be entitled to progressive payment as per billing break-up, based on billing schedule.

51.5	For all items of work order rate schedule, progressive payment shall be limited to 95 % of the gross value of interim bill, as per billing break-up. Balance 5 % shall be released on completion of guarantee period. However, this 5 %, retained from each RA bill, may be released against submission of a separate bank guarantee as per Performance Bank Guarantee format, to be kept valid till guarantee period, subject to fulfilment of following.	
51.5.1	Receipt of certificate that all works are completed in all respects.	
51.5.2	Reconciliation of materials/ T&P/ MMD.	
51.5.3	Completion of final bill formalities.	
51.5.4	Handing over of system/ package to BHEL/ owner.	
51.5.5	Confirmation of full GST credit to BHEL. Any Interest if levied thereon for reasons elaborated in taxes, duties clause of the tender, which is not attributable to BHEL, will be recovered from final payment/ retention/ securities.	
51.6.0	Out of above 95 %, following percent allocations of gross bill amount shall be paid on certification by BHEL after compliance of each of following activity in each month. In case of non-fulfillment of respective activity by successful bidder in each month, no payment shall be made by BHEL against corresponding activity and no claim of successful bidder, at a later date, whatsoever, in this regard will be entertained by BHEL.	
	ACTIVITY	PERCENT (%) ALLOCATON
51.6.1	House-keeping of successful bidder's working area and store/ office areas.	0.50
51.6.2	General illumination of successful bidder's working area and stores, office area.	0.50
51.6.3	Applicable OHSAS requirement as per guidelines of BHEL and as specified in the tender.	0.50
51.6.4	Applicable safety requirement as per guidelines of BHEL and as specified in the tender.	0.75
51.6.5	Applicable security requirement as per guidelines of BHEL.	0.25
51.6.6	Total	2.50
51.7	Successful bidder shall fulfill all formalities for final billing/ contract closing and certification of completion of all service activities.	
51.8	GST can be claimed at any point of contract and payment shall be released upon compliance with following.	
51.8.1	Declaration of successful bidder that such billing/ invoicing in their GSTR-1.	
51.8.2	Receipt of goods/ services and tax invoice by BHEL	
51.8.3	Confirmation of payment of GST thereon by vendor on GSTN Portal	
51.8.4	Above is subject to receipt of goods/ service and tax invoice thereof along with successful bidder declaring invoice in their return and paying GST within timeline prescribed for availing ITC by BHEL.	
51.9	Unless otherwise directed by PMX-BHEL, Kolkata or Construction Manager-BHEL site, successful bidder shall submit jointly signed Monthly planning/execution details and Delay Analysis in BHEL format (Form14 format will be given by BHEL site) with each RA bill.	
51.10	No extra payment shall be made in the event of deferment in payment.	
51.11	All admissible recovery/ adjustment, etc shall be made from progressive payment.	
51.12	BHEL site at their discretion, may further split up percentages of above stages & billing break-up and effect payment to suit site condition, cash flow requirement and according to the progress of work.	
51.2	Subject to the deduction which BHEL may be authorised to make under the contract, you shall, on certification of the engineer at site, be entitled for payment as explained here under.	
51.3	For erection, testing & commissioning of ACC & auxiliaries as detailed in the tender document, progressive payment shall be made as follows on the basis of contract rate/ price	

	as per rate schedule. The following break-up is only for the purpose of progressive payment and should not be construed as total scope of work.		
51.4	As regards mode of payment and measurement of the work completed, relevant clauses of GCC shall be referred to.		
51.5	The break-up for progressive payment for completion of work in various categories of work is as under.		
51.6	Air Cooled Condenser and Auxiliaries. (On the basis of quoted/ accepted rates per MT for Group-I & Group-II).		
	Stages of payment	Percentage allocated	
		Group-I (Structures, A-Frames etc.)	Group-II (Rotating machine & Misc. Eqpt.)
51.6.1	Completion of pre-assembly	10 %	25%
51.6.2	Placement in position	25 %	10%
51.6.3	Alignment, grouting, welding including bolting as required & Non-destructive testing	25 %	30%
51.6.4	Bolting & completion hangers & supports etc. wherever necessary	5%	5%
51.6.5	Piping Pressure Test by Air Leak test method. (Payable for the respective items / Equipments which are linked with the segment wise testing completed)	3%	3%
51.6.6	Completion of overall flushing of ACC through Steam dumping method	2%	2%
51.6.7	Commissioning of ACC system	5%	5%
51.6.8	Finish Painting	10%	5%
51.6.9	Liquidation of pending points	5%	5%
51.6.10	Reconciliation of issued materials	5%	5%
51.6.11	Completion of all contractual Obligation and de mobilization of site office.	5%	5%
	Total	100%	100%
51.7	The accepted rates per MT of PIPING (Group III) shall be distributed in the following manner for releasing payments against RA bills:		
	Stages of payment	Percentage allocated	
		Piping	
51.7.1	Completion of pre-assembly	15 %	
51.7.2	Placement in position	25 %	
51.7.3	Alignment, welding, grouting & bolting as required	40 %	
51.7.4	Completion of nondestructive examination & stress relieving/ heat treatment	10 %	
51.7.5	Completion of hydraulic test(drainable)	02 %	
51.7.6	flushing/ chemical cleaning	01 %	
51.7.7	Completion of Pipe support arrangements	01 %	
51.7.8	Finish Painting	02 %	
51.7.9	Submission of As-built drawings	01 %	
51.7.10	Liquidation of pending points	1.5 %	
51.7.11	Reconciliation of issued materials	0.5 %	
51.7.12	Completion of all contractual Obligation and de mobilization of site office.	01 %	
	Total	100%	

51.8	The accepted rates per MT for Fabrication and Erection of Misc. Structures, Walk-way, Platforms, Staircases etc. (Group IV) shall be distributed in the following manner for releasing payments against RA bills:	
51.8.1	Pre-assembly	20%
51.8.2	And Erection	35%, if pre-assembly is involved.
	or	
51.8.3	Direct erection	55 %
51.8.4	Alignment, bolting, welding	40 %
51.8.5	Finish painting	5 %
	Total	100 %
51.9	The accepted rates per MT of INSULATION (Group V) shall be distributed in the following manner for releasing payments against RA bills:	
51.9.1	Surface preparation/void closing/application of bituminous paints/hook welding etc	15 %.
51.9.2	Application/erection	60 %
51.9.3	Completion of work, like sheeting, sealing completion etc	15 %
51.9.4	Flushing of ACC through Steam dumping method	2%
51.9.5	Readiness of ACC	2%
51.9.6	Finish painting	6%
	Total	100%
51.10	The accepted Unit rates per "SET" of LIFTING DEVICE" (Group VI) shall be distributed in the following manner for releasing payments against RA bills:	
51.10.1	Erection of Complete Assembly	55%
51.10.2	Testing and Commissioning	20%
51.10.3	Load Testing and obtaining statutory Fitness Certificate of the installed device.	15%
51.10.4	Final painting (if applicable) and handing over to BHEL/NTPC	10%
	Total	100%
51.11	PG test assistance. (On the basis of quoted/ accepted rate).	
	Stages of payment	Percentage allocated
	On completion of the PG test of the unit which is to be certified by the BHEL Engineer	100%
51.11.1	In case the PG Test assistance is not required, the payment towards this will not be considered.	
51.12	Out of above break up for progressive payment, **5% will be retained** from each RA bill which will be released on completion of guarantee period. However, this 5% payment can be released against submission of performance bank guarantee valid for the guarantee period as stated above in prescribed proforma subject to receipt of certificate that all works are completed in all respects. The submission of bank guarantee towards performance guarantee is separate and the bank guarantee towards security deposit cannot be utilized for this purpose. The security deposit will be refunded as per GCC.	
51.13	BHEL at their discretions may further split up the above percentages and effect payment to suit the site condition, cash flow requirement and according to the progress of work.	
51.14	EXTRA CHARGES FOR RECTIFICATION/ MODIFICATION	
	As per provision of G.C.C	
51.15	No PVC, rate revision, over run charge/ compensation is applicable for extra works.	
51.16	Bills against Extra work covered under clause 51.14 can be raised only on completion of work. While 95% amount will be released on work completion, balance 5% shall be released on completion of guarantee period.	
51.17	In the event of any dispute regarding acceptance of any work as "EXTRA", the work has to be carried out by keeping man-hour and consumables record jointly signed with remark "for EHQ decision". Under no circumstances, the bidder can refuse to carry out such work with	

	pre-condition, save and except of keeping daily record of category of man-hours and consumables spent for the particular job for further consideration by EHQ at Kolkata.
52.0	**GUARANTEE PERIOD**
52.1	Even though the work will be carried under supervision of BHEL engineers, bidder will be responsible for the quality of the workmanship and shall guarantee the work done for a period of 12 months from the date of start of guarantee period of unit#3, as certified by the engineer for good workmanship and shall rectify free of cost all defects due to faulty erection. In case bidder fails to repair the defective works within the time specified by engineer, BHEL may proceed to undertake the repairs of such defective works at contractor's risk and cost without prejudice to any other rights and recover the same from SD/ other dues.
52.2	The guarantee period will commence from the date of handing over of unit to customer or six months after Final Readiness of unit, whichever is earlier, provided, all erection, testing and commissioning works are completed in all respect for respective unit.
53.0	**INTERMEDIATE MILESTONES AND PROVISION OF PENALTY FOR SLIPPAGE**
53.1	Following Two Intermediate Milestones (herein after considered as M1 and M2) out of the Project Milestone activities noted vide clause no. 28.5 shall be considered for making provision of penalty in case of slippage of these milestones. Milestone “M1” is: Air leak Test of ACC system for Unit # 3, as per time schedule indicated vide tender clause no. 28.5.2. Milestone “M2” is: Overall Flushing through Steam Dumping for ACC Unit # 3 as per time schedule indicated vide tender clause no. 28.5.3 .
53.2	In case of slippage of these Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones.
53.3	In case in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*****, limited to maximum 2% of executable contract value*****, will be withheld.
53.4	In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*****, limited to maximum 3% of executable contract value*****, will be withheld.
53.5	Amount already withheld, if any against spillage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 milestone.
53.6	Amount to be withheld on account of slippage of identified intermediate milestones(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @ 10% of RA Bill amount from subsequent RA bills.
53.7	Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of identified intermediate milestones shall be adjusted against LD or released as the case may be.
53.8	In case of Termination of Contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery.
53.9	In case of LD recovery, the applicable GST shall also be recovered from the contractor.
53.10	All other terms shall be as per the provision of GCC in this regard.
54.0	**LIQUIDATED DAMAGES (LD)**
54.1	If successful bidder fails to complete the job within the tender specified completion period (as per relevant clause of tender),due to reasons attributable to the contractor, they shall pay to BHEL as penalty a sum equivalent to 0.5% of contract price for delay of each week or part thereof to a maximum of 10% of the total contract value.
54.2	BHEL shall deduct the amount of such compensation from any money due or which may become due to successful bidder and/ or recover such compensation from successful bidder’s bank guarantees/ security deposit. To be entitled to impose such compensation, BHEL will not be required to prove that they have incurred such amount as actual damage.
54.3	In case of LD recovery, the applicable GST shall also be recovered from the contractor.
54.4	All other terms shall be as per the provision of GCC in this regard.

Notes:	***Executable Contract Value –** Value of work for which inputs/ fronts were made available to contractor and were scheduled for execution till the date of achievement of the Milestone.
54.5	BHEL reserve the right to purchase from elsewhere on account of and at the risk & cost of successful bidder, without notice to successful bidder of the equipment/ materials not so delivered, without canceling the order/ contract in respect of the equipment/ materials not yet due for delivery.
54.6	BHEL reserve the right to cancel the order/ contract or a portion thereof for the stores not so delivered at your risk & cost and successful bidder shall be liable to BHEL for any excess costs thereof.
54.7	Successful bidder shall continue performance of the order/ contract under all circumstances, to the extent not cancelled.
54.8	Where action is taken as per above, successful bidder shall be liable for any loss, which BHEL may sustain on that account. Successful bidder shall not be entitled to any gain on such purchase and the manner and the method of such purchase shall be at the discretion of BHEL. It shall not be obligatory on any part of BHEL to serve a notice of such purchase on successful bidder.
55.0	**CONTRACT PRICE**
55.1	Bidder shall quote for all the items of Price/Rate schedule.
55.2	Total price for the tendered scope of work will be considered for evaluation and awarding.
55.3	The quantities of the various items mentioned in BOQ cum Price Schedule- Volume-III (refer APPENDIX-I of Vol-IF, TCC for details) is approximate, based on very preliminary information and may vary to any extent or be deleted altogether. The quoted rates of each item will remain firm throughout the period of execution including extension, for reasons what-so-ever, as long as variation in the total value of work executed under any part of this contract including extra items, if any but excluding any price variation remains within plus/minus Fifteen percent (± 15%) of the contract price of LOI/ WO.
56.0	**RATE REVISION**
	No rate revision is admissible under this tender.
57.0	**PAYING AUTHORITY**
	Construction Manager BHEL site office 3x660 MW NORTH KARANPURA Super Thermal Power Project, JHARKHAND
58.0	**ERECTION MANUAL**
	For having preliminary idea about erection sequences, involvement of various activities in erection process, Testing and Commissioning etc. all are indicated in the manual. Also requirement of specific T&P, Cranes etc., safety norms as to be followed while job execution are specified in the erection manual. Bidder may note that works shall be executed as per approved FQP. Approved FQP enclosed in tender.
59.0	DELETED
60.0	**INTEREST BEARING RECOVERABLE ADVANCE/ MOBILISATION ADVANCE**
	NOT APPLICABLE FOR THIS TENDER.

APPENDIX – I

WEIGHT FOR ACC AND ASSOCIATED AUXILIARIES FOR EACH UNIT OF 3X660 MW NORTH KARANPURA PROJECT,

Sl no	Item Description	GR Type	Unit	Quantity	Weight (MT)
A	**Foundation & Structures etc. (GR.-I)**				
1	Anchor plate (EM)	I	set	25	68
2	Under deck structure (UD)	I	set	1	2652
3	Fan beam & decks (OB+FD)	I	set	90	870
4	A frame ,partition wall, Sheeting (AF)	I	set	10	1407
5	Finned tube bundles	I	set	1260	4490
6	Monorails for fan device	I	set	10	50
7	Mono rails on platforms	I	set	1	10
8	Wind Wall structure (WW)	I	set	1	247
9	High strength bolts	I	no	262000	62
10	Condensate Storage tank	I	set	1	38
11	vacumm Dearator	I	set	1	12
12	Condensate Storage tank support structure	I	set	1	45
					9951
B	**Rotating Machine & misc eqp. (GR.- II)**				
1	Fan Bridge & Gratings (FB +GR)	II	set	90	994
2	Fan Motor	II	set	90	180
3	Gear Box	II	set	90	130
4	Fan Hub & blades	II	set	90	200
5	Fan ring/Bell	II	set	90	440
6	Fan safe guard	II	set	90	
7	Vacumm pump for holding & Hogging	II	set	2	58
9	Cleaning pump including Junction box	II	piece	1	0.5
					2003
C	**Ducting &Piping all type (GR. III)**				
1	Tube bundle below header	III	piece	20	360
2	Steam distribution manifold	III	piece	10	860
3	Duct	III	set	1	950
4	Horizontal duct (Dia 9.2 mtr)	III		--	
5	Elbow (Dia 9.2 mtr)	III		--	
6	Vertical Duct (Dia 9.2 mtr)	III		--	
7	Distribution Header (Dia 9.2 to 3.0 mtr)	III		--	
8	Riser (Dia 3.0 mtr)	III		--	
9	Expansions joints	III			---
10	lateral expansion joint (Dia 9.2 mtr)	III	piece	1	29
11	hinged expansion joint (Dia 9.2 mtr)	III	piece	1	30
12	gimbal expansion joint (Dia 9.2 mtr)	III	piece	2	140
13	gimbal expansion joint (Dia 3.0 mtr)	III	piece	20	160
14	hinged expansion joint (Dia 3.0 mtr)	III	piece	10	40
15	Main isolation valves (Dia 3.0 mtr)	III	set	10	300
16	Condansate Pipe and Support	III	set	1	

17	Valve and accessary	III	set	1	
18	Cooling water and make up water piping	III	set	1	
19	Instrument air piping	III	set	1	
20	Rupture Disc	III	piece	10	5
21	Drain pot	III	set	1	12
22	Hp hose under platform	III	set	1	
23	HP SS tube	III	set	1	
24	HP Spring connector and valve platform	III	piece	1	
25	HP hose and platform set	III	set	1	
26	Washing Device Chassis	III	set	1	10
27	Driving device	III	set	1	
28	Nozzle panel	III	set	20	
29	Guide rail	III	set	20	
30	Control panel	III	set	1	
					2896
D	**Fabrication and erection of misc. structure ,walk way, platforms, stair case etc. (GR.-IV)**				
1	Cooled upper condenser platform and ladder	IV	set	10	10
2	Platforms and walk way	IV	set	1	4.6
3	Maintenance platform	IV	set	9	40
4	Stair case and handrails	IV	set	4	150
5	Steel corrugated sheets of wind wall & platform	IV	M2	17000	170
6	Steam Duct Support	IV	set	1	20
7	Constant Spring support	IV	set	10	
					395
E	**Insulation (GR.- V)**				
1	Lightly resin bonded mineral (rock) wool	V	m3	810	120
2	Aluminium plate	V	m2	8500	
3	Accessories	V	t	5	5
					125
F	**Lifting Device (GR. - VI)**				
1	Chain Hoist	VI	Set	10	
2	Electrical hoist (to be ins. Fan deck level)	VI	Set	1	
3	EOT crane for Vacumm pump	VI	Set	1	
4	Eot for drain pump	VI	Set	1	
	Total				**15370**

NOTE

1.0	There is likelihood of addition of new items by BHEL which are integral to this work. Tenderer's quoted/ accepted unit rates shall be applicable for such items also.
2.0	BHEL's decision with regard to classification of a particular item is binding on the contractor.
3.0	For temporary system, required for Hydraulic test, Leak Test, chemical cleaning, Flushing etc, the pumps and vessels/ tanks, Pipings, Valves, Fittings etc will be categorized as Gr-IV (Fab. & Erection of Misc. Structures) and payment will be made as per applicable rate/ MT. No separate payment will be made for dismantling and return of such piping, tanks etc to site store. The tonnage calculated by

	BHEL engineer is final and binding to the contractor. This clause shall supersede all other clauses regarding payment modality for temporary piping system, if appearing contrary to this clause, elsewhere in the tender.

APPENDIX – II

LIST OF T&P TO BE PROVIDED BY BHEL FREE OF HIRE CHARGES ON SHARING BASIS FOR ERECTION AND COMMISIOINING OF UNIT

SL NO	DESCRIPTION & CAPACITY OF T&P	QTY	REMARKS
01	Crawler crane of capacity 300MT/600MT without ringer (as available in site)	01 No	On sharing basis as per availability during the execution period
02	Mid range crane (capacity 250 MT or equivalent)	02 Nos	On sharing basis as per availability during the execution period
03	Mid range crane (100 MT crawler crane or 150 MT Tyre mounted crane)	01 no.	On sharing basis as per availability during the execution period
04	Passenger Elevator for Erection purpose of ACC and Auxiliaries (Based on availability in site)	01 no	Erection, commission, day to day maintenance of Elevator is in bidder's scope
05	Flat Jib Crane (Tower Crane) of adequate capacity)	01 no	On sharing basis as per availability during the execution period

Fuel/Lubricants/Operators (including OT/ Holiday deployment) of above cranes shall be provided by BHEL at free of cost.

APPENDIX – III

MAJOR TOOLS AND PLANTS & MMDs TO BE DEPLOYED BY THE CONTRACTOR Following Major T&Ps to be arranged by contractor within the time against each item		
Major T&P items Description	Quantity	Deployment period from LOI or Hand over of site which is later / Remarks
40 T/ 50T Telescopic Boom Crawler/ Tyre Mounted crane	1No.	Within 30 days
Welding Plant Z X 7400～500 Contravariant DC manual welder ZX7400～500 (rectifier type welding machine rating 400 to 500A)	As required	Within 45 days
DG set. (capacity as per requirement)	1No.	Within 30 days
Scaffolding including tower and walkway Scale for each concrete column of ACC (ACC unit including 25 concrete columns) Barling: 6m – 4m – 2m – Pedal -- Fastening --	As reqd,	Within 30 days
Porta Cabin	1 set	Within 45 days
Angle grinders: Grinding disk diameter : 100mm, Power：670W	10 Nos	Within 30 days
Impact wrench + Sockets. M10～M30	7 Sets	Within 30 days
Torque wrench. M12-M30	8 Nos	Within 30 days
Measuring / levelling equipment (Total station & Auto Level with Staff).	1 Set	Within 30 days
Soft Nylon rings + Chain blocks + Pull-Lifts + U shaped shackles. Nylon sling: 2 M - 2t, 5 M - 10t, 10 M - 20t, Chain blocks 1T, 2T, 3 T, 5T, 10T	10 sets 3 each type	Within 30 days Within 30 days
U shaped shackles 10T , 20T, 25 T	4 sets each	Within 30 days
Sledge hammer in 10 psi, hammer in 2 psi	3 each	Within 30 days
drilling tool in 5-M to 30-M,	1 set	Within 45 days
Steel tape in 10-30	3 sets	Within 30 days
box spanner in 200mm - maximum opening 25mm,	8 Nos	Within 30 days
Adjustable spanner in 300mm - maximum opening 35mm etc.	3 Nos	Within 30 days
D Spanner & Ring Spanner (M48)	2 Set	Immediate
D Spanner & Ring Spanner(M12- M30)	5 Sets each	Immediate
Safety Harnesses + Personal Protection Equipment: Each person will be equipped with one set according to the number of people in ACC building	As reqd.	Within 45 days
12MT and 14 MT New Generation Hydra Crane/ Escort/ Tata P&H-1320 or equivalent	5 Nos.	2 no crane to be deployed immediately on report at site. Balance within 30 days.
Electro Hydraulic Pipe bending m/c	2 Nos	As required at site
Trailers with suitable capacity 30 T	2 Nos	As required at site
Welding Generators (Electric as well as	Around 10	Within 30 days

Diesel)	nos.	
3 Phase complete set up for drawal of Construction Power	As Required	Within 30 days
Radiography arrangement including source and film viewer	2 Nos	Within 45 days
TIG Welding Sets	3 sets	Within 30 days
Stress Reliving equipment with Temperature Recorders	2 Sets	Within 30 days
Electrical Baking Oven (Big)	2 Nos	Within 30 days
Electrical Baking Oven(portable)	15 Nos	Within 30 days
Portable Pipe Cutting & Bending M/C for bending pipes upto Nb 100 mm.	1 No.	Within 45 days
Step Down Transformer(230 V/24V) with adequate number of lamps of 24 Volts	As reqd.	Within 45 days
Erection/Commissioning Fixtures	As reqd.	Within 125 days
Coat-meter for thickness checking of Paint thickness	01 No.	As required
Vernier	As reqd.	Within 30 days
Micro-Meter (both inside and outside)	As reqd.	Within 30 days
Multi Sheave pulley upto 100 MT	As reqd.	As required
Single Sheave pulley blocks upto 20 MT Capacity	As reqd.	As required
Gas cutting torches of different sizes	5 sets	Within 30 days
Pistol Drilling M/c	2 Nos	As required
Wooden / concrete Sleepers	As reqd.	Within 45 days
Air tightness Test pumps	As reqd.	Within 180 days
NDT test kits as per requirement	As reqd.	Within 45 days
Steel Tapes of different sizes as per requirement	As reqd.	As required
Feeler Gauges of different sizes	As reqd.	As required
Vernier Callipers of different sizes as per requirement	As reqd.	As required
Taps and die sets as per requirement	As reqd.	As required
Spirit levels as per requirement	As reqd.	As required
Hg manometer	As reqd.	As required
1.0 KV/500V Megger as per requirement	As reqd.	As required
Spray painting m/c as per requirement	As reqd.	As required
Fillers of different sizes as per requirement	As reqd.	As required
Hydraulic jack (50T & 100T)	2 nos (each)	1 no each to be deployed immediately on report at site. Balance within 30 days.
Portable fire extinguishers as below: Soda acid – 4 sets. Dry chemical powder – 4 sets CO2 – 3 sets. Water & sand bucket (4 buckets in one stand) – 1 sets. Fire hose with nozzle (50 M length) – 2 sets.	Within 60 days	
T&P shown in the above mentioned list are tentative based on planned progress requirement. Actual Mobilisation schedule, based on front availability, drawings and material availability at site is to be reviewed and mutually agreed with BHEL site periodically from time to time for moblisiation of major T&Ps, and the same have to be adhered to. No change will be permitted without written approval of BHEL site.		

Further requirement will be reviewed time to time at site and contractor will provide additional T&P / equipment to ensure completion of entire work within schedule time without any financial implication to BHEL. All other T&Ps shall be provided by the contractor without any extra cost to BHEL. Vendor will give advance intimation & certification regarding capacity etc prior to dispatch of heavy equipment.	
All T&P and all IMTEs, which are required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor at his own cost in working condition.	
In the event of non mobilsation of any T&P by the successful bidder and as a result progress of work sufferred, BHEL reserves the right to deduct suitable amount from the dues of the bidder, with assigning reasons thereof at the following rates	
Major T&P items	Recovery rates
40 T/ 50T Telescopic Boom Crawler /Tyre Mounted crane	Rs.25000/- per week or part there of
Welding Plant Z X 7400～500 Contravariant DC manual welder ZX7400～500	Rs.2000/- per week or part there of
DG set. (capacity as per requirement)	Rs.10000/- per week or part there of
Scaffolding including tower and walkway Scale for each concrete column of ACC	Rs.6000/- per week or part there of
Torque wrench. M30	Rs.1000/- per week or part there of
Soft Nylon rings + Chain blocks + Pull-Lifts + U shaped shackles. Nylon sling: 2 M - 2t, 5 M - 10t, 10 M - 20t, Chain blocks 1T, 2T, 3 T, 5T, 10T	Rs.2000/- per week or part there of
12MT and 14 MT New Generation Hydra Crane/ Escort/ Tata P&H-1320 or equivalent	Rs.25000/- per week or part there of
Electro Hydraulic Pipe bending m/c	Rs.500/- per week or part there of
Trailers with suitable capacity 30 T	Rs.15000/- per week or part there of
Welding Generators (Electric as well as Diesel)	Rs.1000/- per week or part there of
All other Items	As per discretion of Engineer

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

MEASURING AND MONITORING DEVICES (MMD) – Straight Edge, Master Level, Square Level, Inside & Outside Micrometer, Taper Gauge, Filler Gauge, Dial Gauge etc. –---- As per requirement.

APPENDIX-IV

MAJOR CONSUMABLES TO BE PROVIDED BY BHEL FREE OF COST

SL NO	DESCRIPTION OF ITEMS
01	All lubricants, chemicals as required for chemical cleaning / acid cleaning, and the lubricants for trial runs of the equipments and trial operation of the unit

APPENDIX-V

MAJOR CONSUMABLES TO BE ARRANGED BY THE CONTRACTOR

SL NO	DESCRIPTION OF ITEMS
01	Electrodes for CS , SS, AS – As required
02	Filler wire for TIG Welding – As required.
03	Different gases like O2, CO2, Nitrogen, Argon, D/A etc.
04	CTC, Petrol, diesel, kerosene – As required.
05	Lapping pastes
06.	NDE Consumables
07	Hoses and clamps of different sizes – As required
08	Touch –up paints, preservatives and other consumables.
09	Cotton wastes, jutes etc.
10	Primer and Finish Paint (To be sourced from BHEL approved Vendor)
11	Grouting cement as applicable
12	Other consumables to complete the job (other than those quantities supplied by BHEL free of cost as per Appendix IV

NOTE

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