TECHNICAL CONDITION OF CONTRACT FOR EXECUTION OF BALANCE WORK OF ERECTION , TESTING & COMMISSIONING OF LP PIPING & FW PIPING OF U#1,2,3 & COMMON SYSTEMS IN 3 x 660 MW NORTH KARANPURA PROJECT.

These Technical conditions for erection,testing and commissioning of LP Piping & FW Piping 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 site: 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**
	Bidder must visit the site to acquire full knowledge & information about site conditions & to analyze balance scope of work in Balance job of LP Piping & FW Piping , together with all statutory, obligatory, mandatory requirements of various authorities before submission of bid.
3.0	**NAME OF WORK**
	Execution of Balance Work of Erection, Testing & Commissioning of LP Piping & FW Piping of U#1,2,3 & Common Systems at 3X660 MW North Karanpura STPP Project in Chatra district, Jharkhand, which includes material receipt from store, transportation to site, temporary storage prior to erection, pre-assembly, alignment, welding ,erection, dewatering from working area during erection, supply and application of protective coating (as applicable), final painting, testing at site and commissioning of LP piping and Fire Water piping etc. as enumerated in detail in the tender specification and terms & conditions
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 LP Piping and FW Piping 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 supply and application of wrapping coating materials , finish painting, all pre-commissioning tests, start-up and trial run of associated connected equipment, final commissioning, trial run, trouble shooting and handing over of unit to BHEL/ their customer including performance & guarantee (PG) test of unit, reconciliation of materials issued to contractor & returning of 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 , Testing and commissioning of Balance Work

	of LP Piping & FW Piping. **<u>Note to the bidder:</u>** **It may be noted, that a small portion of job of LP Piping & FW Piping has been already executed in site. Before quoting of the tender, the bidder should visit North Karanpura site to get himself apprised about the status of the work already executed and the balance work to be carried out by them for completion of LP Piping & FW piping of all three units and common systems in all respect for successful operation of the units. The quoted price as such should include all these factors.** **All balance work of the partly erected system/components including rectification (if any), commissioning, painting, punch point liquidation etc. is included in the scope of this tender and this shall be carried out by the contractor.** **After getting LOI, the bidder's representative must visit North Karanpura site immediately and prepare a joint balance work reconciliation statement along with BHEL site certifying execution status of different work categories mentioning deficiencies if any), which will be treated as final quantities for partly executed work. In case of any deficiencies, identified later, will be excuted/rectified by the bidder at free of cost. No further additional claim in this regard will be entertained.** **<u>Payment methodology for Partly executed job:</u>** **The balance work for partly executed /fabricated jobs shall be carried out by the bidder as per instruction of BHEL engineer from time to time and payment shall be made as per the unit basic rate. Unit basic rate will be derived for individual item by apportioning the total quoted price in price schedule and further multiplying with percentage breakup mentioned in clause no 51.6, 51.7, 51.8, 51.9, 51.10, 51.11,51.12,51.13,51.14,51.15 as per different work categories.** **For example,** Unit basic rate for CARBON STEEL PIPING (ALL SIZES FROM 1422 OD AND UP TO 711 OD) ALIGNMENT JOB= [Total Quoted price x weightage as per price schedule x Execution percentage (as per 51.6.2)]/BOQ quantity (as per price schedule)
5.1	This scope of work includes the following systems- River/Canal Water Piping / Plant water piping/DMCW/ACW /other low pressure piping/ compressed air GI piping/ misc. piping/FW piping for all three units and common systems for 3X660 MW, North Karanpura Project, Jharkhand.
5.2	The work is to be carried out under the scope of this specification shall broadly comprise of but not be limited to the following- complete work of material handling including arranging for issue of material, receipt from store/ yard, transportation to site, temporary storage prior to erection, internal cleaning, pre-assembly, erection, alignment, welding, dewatering during erection, protective coating (as applicable), final painting, supply and application of wrapping coating material , testing , commissioning of LP piping and Fire Water piping and associated materials, Equipment/piping etc. All the work to be executed in a time bound manner conforming to high standards of quality and workmanship to the satisfaction of BHEL/ Customer who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in their judgment is not in full accordance herewith.
5.3	All material handling equipment, required, shall be arranged by the contractor for locating/loading at storage yard/stores, transport to site including pre-assembly area, unloading at site/working area, pre-assembly at fabrication yard or at working area, inspection, checking and erection except the cranes provided by BHEL for purpose specifically identified elsewhere in this tender specification.
5.4	The approach road for materials movement may not be smooth. Necessary earth filling, dressing of approach road, compaction of approach road, filling of sand bags, laying of steel plates, sands, minor repairs including supply of these materials are in the contractor's scope. Even if it is required to lay steel plate, the same has to be done by the contractor for crane/trailer/truck etc. movement for transportation of materials/ erection activities by the contractor at no extra cost. However, required steel plates shall be issued by BHEL on free of cost and returnable basis. Required transportation of steel plates shall be arranged by contractor within quoted rates. Contractor cannot claim any compensation of time or money on account of bad approach roads, in any weather conditions.
5.5	There are chances of mix up of materials as many materials shall be received from all sources viz. BHEL/ manufacturing Units or Vendors simultaneously. In these cases, the vendor has to search

	/locate the materials from store/yard as the case may be. On completion of tracing the vendor's materials, the vendor should re-stack the balance materials as per the advise of BHEL representatives to suit BHEL's requirement. The vendor has to arrange suitable T&Ps, other means and resources as deemed necessary to meet the above requirement. The above is treated as normal scope of work with no extra cost to BHEL.
5.6	Bidder's area of work consists of the followings for all three units and common areas. a.Plant water system inside the plant boundary including service water and drinking water b.ACW, DMCW piping c.Boiler fill, DM make up piping d.Any other piping under ACW/ DMCW/ Chlorination System water supply piping/ DM water/ ACW blowdown system. e. Piping/equipments of Fire Protection Sys package
5.7	Erection, Testing, Commissioning of All Canal Water, Plant water, ACW (inside TG Bay), DMCW, other LP piping system, Piping of Fire Protection Sys packreage etc. all complete including all its drains and vents, impulse lines as applicable.
5.8	Welding of pipes at terminal points shall be under the scope of this package and required to be done by the bidder
5.9	Final flange connection with equipment like oil coolers/ PHE/ self-cleaning strainers/ gas coolers etc is to be done by the bidder. Gaskets if required replacement, due to leakage/ damage during erection is to be replaced by the vendor free of cost.
5.10	All erectable gaskets, fasteners and other hardware (which are only supplied by manufacturing unit) shall be supplied by BHEL free of cost. However, temporary gasket, if required during testing, shall have to be provided by bidder. Bidder's quoted rates shall be inclusive of this.
5.11	During initial unit commissioning activities, DM water, instrument air, service air, ACW system etc availability through temporary piping and valves may be required. Erection of the same is in the vendor scope. Payment will be made as per applicable erection rate. The piping, valves etc will be provided by BHEL free of cost. However dismantling of the piping, valve etc, its internal cleaning , edge preparation etc for its reuse, if required, will have to done by the contractor without any extra claim
5.12	The contractor may have to carry out fabrication of mitre bends, tees, reducer of sizes NB 250 and above for LP piping systems. Pipes will be supplied in running meters by BHEL free cost. Required number of mitre bends, tees is to be fabricated by the LP piping erection contractor. Payment shall be made as per applicable item of price schedule.
5.13	Supply and application Field painting at site is to be done as per painting schedule (Refer the attached Painting Schedule for LP Piping) duly approved by NTPC. Paints shall be arranged by the contractor at his own cost from BHEL/NTPC approved supplier only.
5.14	Necessary scaffolding, required for painting of surfaces at various locations/ elevations shall be arranged by the contractor at their own cost. All the materials, required for scaffoldings shall be arranged by the contractor at their own cost.
5.15	The instructions of paint manufacturer/ BHEL's engineer shall be followed at all times. Colour code for paints, to be applied on surfaces of various equipment and system , as well as nomenclature and flow direction, shall be furnished during execution as per approval of NTPC/BHEL.
5.16	Coating thickness of painting shall be measured by elcometer or other standard measuring device for measuring of finished film thickness of finished paint. If the thickness is found to be less than specified, the pipes shall be re painted to bring the same to specified thickness.
5.17	The quoted rate will be inclusive of supply and application of painting and no separate payment shall be made for Finish painting.
5.18	Erection & welding, of all valves, misc. fittings required to complete the system but not specifically mentioned in relevant annexure of tender is covered in the scope of contract and payment will be made as per applicable piping item of .All such materials will be supplied by BHEL. The erection activity of valve also includes cleaning, servicing and final painting of valves. All counter flanges, bolts, nuts, washer, gaskets etc shall be supplied by BHEL loose (free issue).
5.19	Commissioning assistance, post commissioning assistance and valve servicing till commercial handover of the plant to customer are included in the scope of work.
5.20	Contractor shall mount all flow indicators, centrifugal/speed switches of motors, accumulators, pressure regulators, etc which are received loose and which are to be erected/mounted at site on air lines, water lines etc. These are to be mounted during erection for finalising routing/position etc. They are to be dismantled after completion of erection work and handed over to BHEL for calibration. After calibration, these instruments shall be remounted by the contractor in their

	respective positions just before commissioning.
5.21	Fixing and Seal welding of Thermowells, plugs before Hydrotest of equipments and piping systems is also within the scope of this work/specification. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld Thermowells after Hydrotest/steam blowing of lines.
5.22	Welding of all Thermowells, draft, pressure and temperature instrumentation points, and all other instrumentation points on piping, and auxiliaries is within the scope of this work.
5.23	Certain instrumentation like, pressure gauges, power cylinders, flow meters, valve actuators, flow indicators, etc are received in assembled condition as integral part of equipments. Contractor shall dismantle such equipment at an appropriate stage under the instruction of BHEL and hand them over to BHEL for calibration and storage. Contractor shall re-erect them in position just before commissioning of the equipment. Commissioning of the actuator is excluded from the scope of work.
5.24	During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer at no extra cost to BHEL.
5.25	Permanent Approach platforms for access to valves/equipments/systems which are not regular in nature are included in the contractor's scope of work at no extra cost to BHEL. Necessary materials shall be issued at free of cost by BHEL
5.26	Contractor shall carry out preservation painting on all items taken from stores. The preservation painting has to be carried out on material taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer and the portion of items or the complete items needing painting shall be carried out to the satisfaction of BHEL engineer. This facility shall be provided by the contractor till the commissioning and handing over of the equipment to the customer. Preservative and touch up painting on equipments covered under this specification stored at stores/storage yard shall also be carried out by the contractor at no extra cost.
5.27	Adjustment of spring hangers for piping shall be done by the contractor during initial erection. After initial commissioning trials, it is possible that the spring hangers have to be adjusted repeatedly till the correct spring compression is achieved. Contractor shall do the same to the satisfaction of BHEL engineer. The marking of cold and hot positions on the hangers shall be done by the contractor. Necessary arrangements for scaffoldings etc. are to be arranged as per the requirement and may have to be repeated upto the satisfaction of BHEL/Customer. This is treated as normal scope of vendor's work without any cost implications to BHEL.
5.28	The contractor shall return to BHEL the excess materials left over after completion of work material issued for temporary pipelines for HT, chemical cleaning, oil drums, containers, packing materials, flushing, blowing etc. and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge preparation (vee), painting etc. to the condition similar to the one at the time of issue shall be in scope of work.
5.29	Any other connected material supply which is not covered in BOM but required to complete the system shall be erected by the vendor and payment in this case shall be made as per applicable item rate.
5.30	Minor modification of erected pipes shall be carried out by the contractor for which no extra claim shall be admissible. Any major rework required after completion of work, shall be carried out based on man-hours and the same shall be done by a special team/ gang without affecting the regular work. The record of extra man-hours in carrying out the re-work shall be maintained by the contractor which shall be duly verified and approved by BHEL Site engineer
5.31	Pipelines from service air header is to be laid by contractor as per site routing as per instructions of BHEL site engineer and payment will be made as per applicable item of price schedule.
5.32	Erection of all drains, vents, instrument tapping points with root valves, water traps etc. integral to the piping system shall be in the scope of contractor and site routing of drain, vent and miscellaneous

	small bore pipe shall be carried out as per direction of BHEL engineers.
5.33	For small bore piping, which is supplied in running length, electro-hydraulic pipe bending machines and pipe chamfering machine will be arranged and used at least to cater 3" schedule 160 pipes at site by the contractor.
5.34	Hanger and support/ anchors/ restraints, stubs for drains/ vents/ welded type thermowells, welding pressure connection, sockets, rain hood, cowls, aux structures for pipe supports etc for piping will be issued free as loose items. Erection, welding, painting etc of these items as per BHEL drawing is in the scope of contractor and payment for these items shall be made as per applicable item of price schedule. Seal welding of threaded thermowell with matching welding electrode is to be done by the vendor without any extra claim.
5.35	Bidders to exercise utmost care while doing execution and commissioning work for this package so that no damage is caused to any other erected system. Repairing charges towards such damage will be recovered from bidder.
6.0	**TECHNICAL SPECIFICATIONS FOR LP PIPING**
6.1	This specification is mainly intended to cover the erection & commissioning of River/Canal Water Piping / Plant water piping/DMCW/ACW/other low pressure piping/ misc. piping, which shall cover handling from storage, erection, testing, inspection, final painting, testing, servicing and commissioning of piping & fittings as covered in specification.
6.2	The work to be carried out under the scope of this specification shall broadly comprise of but not be limited to the following systems.
6.3	Plant water system inside the plant boundary including service water and drinking water and termination point outside plant boundary.
6.4	ACW, DMCW piping
6.5	Any other piping under ACW/ DMCW/ Chlroination System water supply piping/ DM water/ ACW blowdown system.
6.6	Deleted
6.7	Instrument/ service air piping of main plant and Aux. building.
6.8	Piping/equipments of Fire Protection Sys package
6.9	All Canal Water, Plant water, ACW (inside TG Bay), DMCW, other LP piping system, Piping of Fire Protection Sys package etc. to be completed includes all its drains and vents, impulse lines as applicable.
6.10	BHEL reserve the right to get executed through the contractor any LP piping system work not mentioned in the tender document specifically (permanent/ temporary/ contingency nature), but required as per project requirement. Payment shall be made for such item as per applicable price schedule. However, no extra payment shall be made for dismantling of temporary/ contingent piping system.
6.11	The welding of pipes at terminal points shall be under the scope of this package and required to be done by the vendor.
6.12	Final flange connection with equipments like oil coolers/ PHE/ self-cleaning strainers/ gas coolers etc is to be done by the bidder. Gaskets if required replacement, due to leakage/ damage during erection is to be replaced by the vendor free of cost including supply of the gasket of required specification.
6.13	All erectable gaskets, fasteners and other hardware shall be supplied by BHEL free of cost. However, temporary gasket, if required during testing, shall have to be provided by bidder. Bidder's quoted rates shall be inclusive of this.
6.14	During initial unit commissioning activities, DM water, instrument air, service air, fuel oil, ACW system etc availability through temporary piping and valves may be required. Erection of the same is in the vendor scope. Payment will be made as per applicable erection rate. The piping, valves etc will be provided by BHEL free of cost. However dismantling of the piping, valve etc, its cleaning and edge preparation, for its reuse, if required, will have to done by the contractor without any extra claim. Cutting of tees, elbows/ reducers to suit the pipe fitting/ erection as required, is to be done without any extra claim.
6.15	The contractor may have to carry out fabrication of mitre bends, tees, reducer of sizes NB 250 and above for LP piping systems. Pipes will be supplied in running meters by BHEL free cost. Required number of mitre bends, tees is to be fabricated by the LP piping erection contractor. Payment shall be made as per applicable item of price schedule.
6.16	Scope of Field painting at site is as per painting schedule (Refer the attached Painting Schedule for LP Piping) duly approved by NTPC. Paints shall be arranged by the contractor from BHEL/NTPC approved supplier only.
6.17	Necessary scaffolding, required for painting of surfaces at various locations/ elevations shall be arranged by the contractor at their own cost. All the materials, required for scaffoldings shall be

	arranged by the contractor at their own cost.
6.18	The instructions of paint manufacturer/ BHEL's engineer shall be followed at all times. Colour code for paints, to be applied on surfaces of various equipment and system, shall be furnished during execution as per approval of NTPC/BHEL.
6.19	Coating thickness shall be measured by elcometer or other standard measuring device for measuring of finished film thickness of finished paint. If the thickness is found to be less than specified, the pipes shall be re-surfaced to bring the same to specified thickness.
6.20	The quoted rate will be inclusive of supply and application of painting and no separate payment shall be made for Finish painting.
6.21	Erection & welding, of all valves, misc. fittings required to complete the system but not specifically mentioned in relevant annexure of tender is covered in the scope of contract and payment will be made as per applicable piping item of mechanical price schedule. All such materials will be supplied by BHEL. The erection activity of valve also includes cleaning, servicing and final painting of valves. All counter flanges, bolts, nuts, washer, gaskets etc shall be supplied by BHEL loose (free issue).
6.22	Commissioning assistance, post commissioning assistance and valve servicing till commercial handover of the plant to customer are included in the scope of work.
6.23	Calibration and commissioning of motor -actuated valves, pneumatic control valves, calibration of various measuring devices, including cabling is excluded from the scope of work.
6.24	Necessary excavation for buried pipe and backfilling with earth is excluded from the scope of bidder and shall be done by BHEL. BHEL will release excavated clear front to bidder for erection of buried pipe. Dewatering with all necessary arrangement required after handing over of excavated front is under the scope of bidder. Foxholes (cutting of earth below pipe joint) for welding will be in vendor scope. No separate payment shall be made on account of fox holes, dewatering, as detailed above and the erection and commission rate as per price schedule of River/Canal Water piping shall be inclusive of the same. Concrete bedding/ encasing is excluded from scope of work.
6.25	Any other connected material supply which is not covered in BOM but required to complete the system shall be erected by the vendor and payment in this case shall be made as per applicable item rate.
6.26	Minor modification of erected pipes shall be carried out by the contractor for which no extra claim shall be admissible. Any major rework required after completion of work, shall be carried out based on man-hours and the same shall be done by a special team/ gang without affecting the regular work. The record of extra man-hours in carrying out the re-work shall be maintained by the contractor which shall be duly verified and approved by the purchaser.
6.27	Quantities given in the relevant annexures and price schedule are indicative only. Actual supplies shall be made based on the drawings finally approved by customer.
6.28	Pipelines from service air header is to be laid by contractor as per site routing as per instructions of BHEL site engineer and payment will be made as per applicable item of price schedule.
6.29	Erection of all drains, vents, instrument tapping points with root valves, water traps etc. integral to the piping system shall be in the scope of contractor and site routing of drain, vent and miscellaneous small bore pipe shall be carried out as per direction of BHEL engineers.
6.30	For small bore piping, which is supplied in running length, electro-hydraulic pipe bending machines and pipe chamfering machine will be arranged and used at least to cater 3" schedule 160 pipes at site by the contractor.
6.31	Hanger and support/ anchors/ restraints, stubs for drains/ vents/ welded type thermowells, welding pressure connection, sockets, rain hood, cowls, aux structures for pipe supports etc for piping will be issued free as loose items. Erection, welding, painting etc of these items as per BHEL drawing is in the scope of contractor and payment for these items shall be made as per applicable item of price schedule. Seal welding of threaded thermowell with matching welding electrode is to be done by the vendor without any extra claim.
6.32	All pipe supports/ anchors coming on concrete floors/ walls are to be fixed with expansion/ rawl bolts with nuts. The same will be issued free to the bidder by BHEL.
6.34	Bidders to exercise utmost care while doing execution and commissioning work for this package so that no damage is caused to the existing plant at site. Any such damage will be back charged to bidder.
6.35	**PRECAUTIONS AGAINST FLOATATION**

6.35.1	When pipe line laid underground or above ground in a long narrow cutting gets submerged in water collected in the trench or cutting, it is subjected to an uplift pressure due to buoyancy and is likely to float if completely or partly empty. In the design of pipelines, provision is made to safeguard against floatation by providing sufficient over burden or by providing sufficient dead weight by means of blocks, etc. In case the works extend over one or more monsoon seasons, special care and precautions are necessary during the progress of work on this account. Contractors shall close pipe line, if required, by blank flanges well in time for the monsoon. The work of providing blocks, refilling the earth to the required level and compacting the same etc shall always be done as soon as the pipe line in the cutting has been laid.
6.35.2	The contractor shall see that the water shall not be allowed to accumulate in open trenches where work is in incomplete stage, precautionary works such as blank flanging the open ends of the pipe line and filling the pipe line with water etc. shall be taken as directed by the engineer. Such works shall be to the contractor's account and no separate payment will be made for the same.
6.35.3	Protection of pipeline against floatation during the contract period shall be the responsibility of the contractors. Should any section of the pipe line float due to their negligence etc. the entire cost of laying it again to the correct line and level shall be to the contractor's account.
6.36	**COATING & WRAPPING OF BURRIED PIPES**
6.36.1	This specification covers the supply of material, application, inspection, testing including supervision of coal tar protection tape.
6.36.2	Any of the following may be considered for coating of the buried Pipe – 1. Coal tar primer, coal tar enamel, inner wrap of fiber glass, final outer wrap of enamel impregnated fiber glass (as per IS 10221). Total thickness of coating shall not be less than 4.0 mm. 2. Coal Tar based Anti-Corrosion tape of minimum thickness 4 mm (confirming to IS 15337)
6.36.3	COATING THICKNESS
	The wrapping & coating system shall consist of applying pre-wrapping solution on the cleaned surface followed by the application of anti-corrosion protection tape spirally or circumferentially on the surface keeping proper tension and maintaining good adhesion with an overlap of 12 – 13 mm. The minimum thickness of coating shall be 4.0 mm.
6.36.4	TECHNICAL REQUIREMENTS
6.36.4.1	The coating and wrapping operation shall include surface preparations including shot blasting of pipes to remove paints, rust and achieve required surface finish, application of pre-wrapping solution (primer) and application of layer of anti-corrosion protection tape and necessary testing. The above operation shall be performed under the supervision of tape supplier/ qualified personnel of the contractor and performed by personnel skilled in the application of same type of pre-fabricated tapes.
6.36.4.2	Inspection of the coating and wrapping of the pipes like adhesion test, holiday test etc. as per FQP shall be performed by qualified inspectors under supervision of tape supplier.
6.36.4.3	BHEL/ customer reserve the right to inspect the material at supplier's works.
6.36.5	INSPECTION
	BHEL/ customer reserve the right to test the coating and any repair subsequently made to it as per BHEL/ customer approved QP/other documents. The testing shall be carried out prior to laying of pipes in the trench. Final acceptance of all coating and wrapping work shall be determined by BHEL/owner's representative after completion of wrapping over the welding joints. Pipes which have been cleaned and primed or coated and wrapped without having been inspected and approved by owner's representative shall liable to be rejected.
6.36.6	HOLIDAY DETECTION
6.36.6.1	All coated and wrapped pipes subjected to test with an electric holiday detector as specified in relevant IS
6.36.6.2	The holiday detector shall be supplied, correctly operated and always maintained in good condition along with adequate supply of spare parts. Any delay caused by the incorrect functioning of the holiday detector will not be entertained.
6.36.6.3	The operating voltage of the detector shall be determined by relevant IS
6.36.6.4	Any pipe having three (3) or more holidays shall be rejected. Similarly any pipe having any one holiday bigger than 0.1 sq mtr shall be rejected. Any defective places shall be plainly marked with chalk immediately after they are detected visually or by the holiday detector.
6.36.6.5	For pipe with pre-fabricated tape, the test voltage which the pipe should pass with holiday detector

	kit at voltage 15 KV for 4 mm thickness coating.
6.36.7	MEASURING COATING THICKNESS
6.36.7.1	All pipes shall be tested for thickness as per applicable IS.
6.36.7.2	Thickness shall be measured by pushing the point of an approved pit depth gauge or micro-tester through the coating and wrappers.
6.36.7.3	Specified minimum thickness shall be present both at the pipe or any other point.
6.36.8	GENERAL GUIDELINES FOR TESTING THE ADHESION OF THE COATING
6.36.8.1	At least two tests a day shall be carried out on finished coating after 72 hours from completion of coating. The test shall be carried out as per relevant IS. The areas where the coating has been removed for testing by the inspector shall be repaired by the contractor at his own expense.
6.36.8.2	During laying of buried piping etc, contractor may have to erect supporting structures etc for safeguarding existing RCC drains, cable trenches, River/canal water piping, DMW piping system and other installations, as applicable. Contractor shall submit a scheme in this regard in advance for BHEL's approval. BHEL will supply necessary supporting structural steel in this regard and payment for execution by contractor shall be made as per applicable item price schedule.
6.36.9	**WELDING, HEAT TREATMENT & RADIOGRAPHY**
6.36.9.1	The pipes shall be welded strictly in conformity with the methods as indicated in the detailed drawing or as instructed by BHEL engineer. BHEL engineer will have the option to change the method to suit site conditions. All the prepared/ matched edges will have to be suitably protected to prevent rusting or foreign material ingression.
6.36.9.2	Welding of high tensile structural steel shall be done by using certified welders, who possess requisite certificate and who are approved by BHEL engineer.
6.36.9.3	All welders shall be tested and approved by BHEL engineer before they are actually engaged on the work even though they may posses the requisite certificates. BHEL reserves the right to reject any welder without assigning any reasons. The welder identification code as approved by the BHEL engineer shall be stamped by the welder on each joint done by them. The contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by BHEL.
6.36.9.4	BHEL engineer is entitled to stop any contractor's welders from his work if his work is unsatisfactory for any technical reason or there is a high percentage of rejection of joints welded by him, which in the opinion of BHEL engineer, will, adversely affect the quality of welding. Even though the welder has earlier passed the tests it does not relieve the contractor from his contractual obligations, to check the performance of the welders.
6.36.9.5	All charges for testing of welders including destructive and non destructive tests, if conducted by BHEL or by the inspecting agency shall have to be borne by the contractor. Test material shall be supplied free by BHEL, but the welding electrodes shall have to be arranged by contractor at his cost.
6.36.9.6	All welded joints shall be subjected to acceptance by BHEL engineer/ customers. All welding /pre heating, post heating various NDT tests etc. shall be carried out as per BHEL /Customer approved drawing/doc. Contractor has to arrange for regular evaluation of radiographs without accumulation of any backlog.
6.36.9.7	Preheating and post-heating, if required, shall be treated as part of erection work and shall be performed by the contractor in accordance with the instructions of BHEL engineer.
6.36.9.8	All low hydrogen electrodes shall be baked and dried up to 350 deg C for an hour in an electric electrode drying oven and shall be kept at 150 deg C before they are used in erection work, and all welders including high pressure welders shall have a portable electrode drying oven at the work spot.
6.36.9.9	All butt joints of piping shall be carried out by arc welding only. All the electrodes of BHEL/ customer approved quality and make, required for the piping and structural works etc to be arranged by the vendor within his quoted price.
6.36.9.10	The technical particulars, specifications and other general details of work shall be in accordance with AWS 0.1.1.72, Clause 6.11 or ASME Section IV, V & IX or ANSI B 16.25 as specified by BHEL.
6.36.9.11	Contractor shall note that NDT requirement should be compiled as per approved welding schedule. Generally 10% minimum radiography shall be done on the welding joints of various piping system followed by hydro test. However, percentage may be increased depending upon the quality of joints at the discretion of BHEL/Customer.
6.36.9.12	Low speed high contrast fine grain films (D-7 or equivalent) in 10 cm width only should be used for weld joint radiography. Film density shall be between 1.5 to 2.0.
6.36.9.13	All radiographs shall be free from mechanical, chemical or process marks to the extent they shall not confuse the radiographic image. Radiography should be taken only after removal of cleats etc by grinding from tubes wall for getting better image.
6.36.9.14	Penetrometer as per ASME/ ISO, shall be used for all exposures.

6.36.9.15	Lead numbers and letters (generally of 6 mm size) are to be used for identification of radiographs. Contract no, joint identification, source used, welders identification, SFD used are to be noted down in the paper cover of radiography. Load intensifying screens for front & back of the film shall be used as per instructions of BHEL engineer.
6.36.9.16	The weld joint is to be marked with permanent mark A, B, C, etc to identify the segments. For this, a low stress stamp shall be used to stamp the pipe on the downstream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.
6.36.9.17	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.
	All the radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL.
6.36.9.18	The defects as pointed out by BHEL engineer/ inspecting agency, shall be rectified immediately to the satisfaction of engineer and re-radio graphed. The decision of engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.
6.36.9.19	Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced, immediately.
6.36.9.20	The contractor shall also be equipped for carrying out other NDT, like liquid penetrant inspection, magnetic particle inspection and ultrasonic testing as & when required for work within the quoted rates.
6.36.9.21	In lieu of radiography, 100 % ultrasonic testing may be adopted suiting the job requirement. In case hydro test of CW/ACW piping cannot be conducted, contractor shall carry out 100 % DPT on back gousing and 100 % UT for CW/ACW pipe-line in substitute for radiography and hydro test with in the same quoted rate subject to approval of BHEL/ customer. In such case, payment due against completion of hydro test of CW piping as per item price schedule will be due after completion of this activity as detailed above further to certification of BHEL site engineer. Contractor must be equipped with state-of-art ultrasonic machine having recording facility. All the records shall be preserved and shall become the property of BHEL.
6.36.9.22	For carrying out ultrasonic testing of welded joints large size pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.
6.37	**CLEANING /HYDRO TESTING /PNEUMATIC TESTING OF PIPING SYSTEM**
6.37.1	The cleaning operation is in the scope of contractor and shall be carried out as per BHEL instruction mainly consisting of (a) Mechanical cleaning; (b) Air blasting (by rupture method); (c) Water flushing; (d) Steam blowing etc as per guidelines of BHEL engineers.
6.37.2	In case, Hydro test of all piping is not possible to carry out maintaining over all schedule and other site logistics , it shall be conducted as per BHEL instructions. Necessary motorized hydro test pump, filling hoses, gauges etc shall be arranged by the contractor at his own cost. Test pressure shall be as per BHEL drawing/ BHEL engineer instruction.
6.37.3	The contractor shall service, erect, dismantle and return temporary pipes for carrying out cleaning/ hydro test/ pneumatic test as required with no extra charges and no payment shall be paid on item rate for erection of temporary piping. All piping material, valves etc for temporary looping shall be issued to contractor free by BHEL.
6.38	**FIELD FINAL PAINTING (EXTERNAL SURFACE)**
	Above ground ACW /ECW/PLANT WATER pipes (which are not buried) will be generally received with external surface in painted condition with primer coat and 2 coat of finish paint. However, application of Final coat of Finish paint as well as touch up primer and touch up finish paint in the worn out/ damaged/ welded portion is in the scope of the work.
6.39	**PROCEDURE OF CIVIL WORK FOR BURRIED PIPE**
	Civil work for buried piping shall be done by the executing civil agency as per approved drawing and document. Bidder have to suitably co-ordinate with the civil agency for execution of pipe laying job (exclusively for underground piping job) as per their planned working schedule. BHEL shall provide necessary support for availability of required civil fronts for pipe erection activities.
6.40	**EXCLUSION**
6.40.1	Civil works including excavation, back filling, sand filling etc for buried piping
6.40.2	All Civil Rack, pedestal for above ground piping
6.40.3	All electrical and C&I job is excluded.
6.40.4	Dry out of all Motors is excluded.

6.40.5	Actuators /Limit switches setting, position feedback calibration and operation/commissioning for motor operated valves/dampers / probe, if any is excluded from the scope	
6.41	**SCOPE OF PLANT FIRE WATER SYSTEM**	
	This specification covers complete work of handling of materials of FW piping including arranging for issue of material, receipt from store/ yard, transportation to site, temporary storage prior to erection, erection & welding, dewatering during erection, final painting, testing at site and commissioning as per the scope for the below mentioned areas.	
6.41 .1	**Fire Hydrant System (Water Based Fire protection System)**	
a	Main Plant Area	
b	Water system	
c	Fuel Oil system	
d	Coal Handling Plant	
e	Ash Handling Plant	
f	Non Plant Building	
6.41.2	**High velocity Spray system (Water Based Fire protection System)**	
a	Generator Transformers	
b	Unit Transformers	
c	Unit Auxiliary Transformers	
d	Station Transformers	
e	Any other transformer greater than 10 MVA or in the case of oil filled transformers with oil capacity greater than 2000 litres	
f	Main turbines lube oil tanks, oil coolers & purifier unit	
g	Central lube oil tanks (both clean & dirty oil tanks) & its purifier units	
h	Turbine oil canal pipeline in the main plant	
i	BFP lube oil tanks, coolers, consoles etc	
j	Boiler burner fronts including fuel oil racks.	
k	Generator seal oil system tanks, cooler assembly	
6.41.3	**Medium velocity Spray system (Water Based Fire protection System)**	
a	Cable Gallery in TG Bldg & ESP Building	
b	Coal conveyors & transfer points, crusher house	
c	Fuel Oil Storage Tank	
d	Fuel Oil Pumping Station (Unloading & Pressurising)	
e	DG Diesel Tank	
f	Boom & intermediate / tripper conveyors of stacker reclaimer machines	
6.41.4	**Foam system**	
a	Fuel Oil Storage Tank	
6.41.5	Installation of Spray Nozzles, Q B Detectors etc. required for completion of Fire Fighting System included in the bidder's scope without any additional cost to BHEL. Material will be issued by BHEL at the free of cost .	
6.41.6	Installation of Fire Hydrants Monitor on Fire Water Network included in the bidder's scope without any additional cost to BHEL. Material will be issued by BHEL at the free of cost.	
6.41.7	Installation of Pressure Relief Dampers in Control Room included in the bidder's scope without any additional cost to BHEL. Material will be issued by BHEL at the free of cost.	
6.41.8	Installation of around 700 Nos. different types of Fire Extinguisher included in the bidder's scope without any additional cost to BHEL. Material will be issued by BHEL at the free of cost.	
6.42	Followings Tests are to be conducted at site by bidder without any additional cost to BHEL.	
	TESTS TO BE CONDUCTED	**Qty.**
6.42.1	Hydro Test of all the lines (Charged with water) - 1.5 times of the design pressure	For 100 % Piping
6.42.2	Radiography - 10 % of the welded joints	10 % of Butt welded Joints
6.42.3	Adhesion test & Holiday test - Underground piping	For 100 % Piping
6.42.4	Flushing of all the line (Open to atmosphere)	For 100 % Piping
6.42.4	Die Penetration test for all longitudinal & cross weldings	100 % of Fillet & Butt welded Joints
6.42.5	Dry Film Thickness test for paint	For 100 % Piping.
6.42.6	TAC approval - for the total system after erection	For complete System

7.0	**SERVICES TO BE RENDERED BY THE BIDDER**
	Services to be rendered by the bidder 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	Providing assistance for Trial run and commissioning to the satisfaction of owner/ BHEL till handover.
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	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 Factory Inspector, Inspector of Explosives etc , as applicable, for respective portions of work under the jurisdiction of such statutes of laws.
7.8	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.
7.9	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.
7.10	Replacing / cleaning of filters of the erected equipments and piping system etc. during pre-commissioning / commissioning stage is within the scope of work.
7.11	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.
7.12	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.
7.13	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.
7.14	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.
7.15	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.
7.16	After the start of commissioning activities, 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 for providing dedicated commissioning assistance, major /minor repairs, troubleshooting etc. A. Pipe Fitters / General Fitters / Millwright Fitters - 2 nos. B. Rigger / unskilled workers - 4 Nos. C. Supervisor - 1 No. D. Welder - 2 Nos. The above figures shows only minimum requirement. Contractor has to provide number of personnel of various categories as per work demand and necessity at site. No extra charges will be payable for providing these services .
7.17	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.
7.18	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 (pertaining to erection scope only) shall be serviced and lubricated to the satisfaction of BHEL Engineer during the erection and commissioning as per BHEL Engineer's instructions.
7.19	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.
7.20	Contractor should specifically have 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.
7.21	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.
7.22	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.
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 at-least 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 this 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 Site engineer 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 the scope of work gets delayed beyond the contract period, the contractor shall request BHEL for an extension of the contract and BHEL at its discretion may extend the contract depending on the balance work left out.
13.2	Based on the jointly signed monthly reviews , the work balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. 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	**DELETED**
15.0	**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 deploy all skilled workmen like welders, gas cutters, electricians, riggers, sarangs, erectors, fitters, laggers, tin-smiths, ,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 competent manpower 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 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 till handing over of the unit, a dedicated gang along with an exclusive supervisor, need to be deployed by the contractor to attend the incidental works of commissioning /trouble shooting/ rectification as per the instruction of BHEL commissioning engineer. The gang need to be provided during night shift also whenever required as per instruction 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,trench & 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 .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 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/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/ Customer.
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 minimum number of FQA Engineers have been envisaged . However, as per site requirement ,additional FQA Engineers may have to be deployed without any additional cost implications to BHEL.
	For LP Piping works – 1 No.
	For FW Piping works– 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 , 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.
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 , after proper dismantling of establishment, levelling etc. as per instruction of BHEL /Customer engineer.
21.2	**WATER**
21.2.1	BHEL will provide single point supply for construction & drinking water inside the project premises for office free of cost. Further necessary network for construction & drinking water system shall be done

	by the bidder at his own cost.
21.2.2	Contractor should arrange for water for labour colony of their own.
21.2.3	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and the contractor shall claim no compensation for delay in work for such interruption. Contractor may make standby arrangement for water at their own cost.
21.2.4	Contractor will have to arrange for storage of water to meet the day-to-day requirement.
21.2.5	The availability of water (construction as well as drinking) may be limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.
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 4 MCCB ,CBCT, ELR etc of adequate capacity. The Board should be fitted with Ammeter (0-800 Amps) and Voltmeter (0 – 600 Volt). Outgoing Feeders should be fitted with 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. All T&Ps are to be certified by the Third party approved by competent authority in presence of BHEL & NTPC.
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. BHEL will make overall area illumination inside plant.
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 make necessary arrangement of 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	No medical facility within/ near the site shall be provided by BHEL.
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 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. **No staff quarter shall be provided by 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 LP Piping & FW Piping Balance Work**	
	Milestone	Schedule
28.5.1	BLU of U#1	2 months
28.5.2	Steam Blowing of U#1	7 months (M1)
28.5.3	Synchronisation of U#1	10 months
28.5.4	BLU of U#2	7 months
28.5.5	Steam Blowing of U#2	12 months
28.5.6	Synchronisation of U#2	15 months
28.5.7	BLU of U#3	13 months
28.5.8	Steam Blowing of U#3	18months (M2)
28.5.9	Synchronisation of U#3	21 months
28.5.10	Completion of Facilities	24 months
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 1 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 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 computer/ printer 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 one (1) no. computer operator and one (1) number service staff for miscellaneous service for BHEL's use at site/ Kolkata for reconciliation, progress review & day-to-day planning purpose, documentation etc. These facilities are to be provided within 30 days from 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 computer operator. Or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.	
29.3	@ Rs 15,000/- (Fifteen thousand) / month for 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 daily /weekly /monthly progress reports to BHEL Site Office in the agreed formats submitted in adequate number of signed originals, as per instruction of BHEL Site Engineer.
33.2	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.
33.3	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 ACW Underground piping The Crane shall be normally available on sharing basis 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 and 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	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.
37.4	The contractor must not use these equipments for any purpose other than what they are intended for.
37.5	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 pertaining to scope shall be completed within a period of **24 months** (Twenty Four months) from the date of start of work at site, as certified by BHEL Site Construction Manager.
46.2	The bidder shall arrange to mobilise and start the erection work within 15 days from the date of issuance of LOI/ Intimation from BHEL Site , whichever later.
46.3	The actual date of start of work will be certified by BHEL site in-charge/Construction Manager after adequate mobilisation of manpower, T&P by the contractor. This certificate date will be deemed as start of work 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.
51.1.1	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 45 days of receipt of bill.
51.1.2	Measurement will be taken as specified in terms & conditions of the contract and certified by BHEL engineer of actual work.
51.1.3	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.
51.1.4	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.
51.1.4.1	Receipt of certificate that all works are completed in all respects.
51.1.4.2	Reconciliation of materials/ T&P/ MMD.
51.1.4.3	Completion of final bill formalities.
51.1.4.4	Handing over of system/ package to BHEL/ owner.

51.1.5	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.	
51.1.6	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
51.1.6.1	House-keeping of successful bidder's working area and store/ office areas.	0.70
51.1.6.2	General illumination of successful bidder's working area and stores, office area.	0.30
51.1.6.3	Applicable OHSAS requirement as per guidelines of BHEL and as specified in the tender.	0.20
51.1.6.4	Applicable safety requirement as per guidelines of BHEL and as specified in the tender.	0.3
51.1.6.5	Total	1.50
51.1.7	Successful bidder shall fulfill all formalities for final billing/ contract closing and certification of completion of all service activities.	
51.1.8	GST can be claimed at any point of contract and payment shall be released upon compliance with following.	
51.1.9	Declaration of successful bidder that such billing/ invoicing in their GSTR-1.	
51.1.10	Receipt of goods/ services and tax invoice by BHEL	
51.1.11	Confirmation of payment of GST thereon by vendor on GSTN Portal	
51.1.12	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.	
51.1.13	Unless otherwise directed by PMX-BHEL, Kolkata or CM, BHEL site, successful bidder shall submit jointly signed Fom-14 (format will be given by BHEL site) with each RA bill.	
51.1.14	No extra payment shall be made in the event of deferment in payment.	
51.1.15	All admissible recovery/ adjustment, etc shall be made from progressive payment.	
51.1.16	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 .	
51.3	For erection, testing & commissioning of LP PIPING & FW PIPING as detailed in the tender document, progressive payment shall be made as follows on the basis of contract rate/ price as per price 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.	
	LP PIPING & FW PIPING PAYMENT BREAK UP	
	Stages of payment	**Percentage allocated**
51.6	**Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of River/Canal water piping / ACW piping / DMCW piping / Plant Water piping (CARBON STEEL PIPING (ALL SIZES FROM 1422 OD AND UP TO 711 OD) and associated material (covering fittings and valves etc)**	
51.6.1	ERECTION	35%
51.6.2	ALIGNMENT	5%
51.6.3	WELDING	38%
51.6.4	NDT	10%
51.6.5	HYDRAULIC TEST	5%
51.6.6	PAINTING COMPLETION	5%
51.6.7	AS BUILT DRAWING SUBMISSION	2%
51.7	**Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of ACW piping / DMCW piping / Plant Water piping / Service and Portable water piping (CARBON STEEL PIPING (ALL SIZES BELOW 711 OD AND UP TO 150 NB) and associated material (covering fittings and valves etc) as per tender.**	

51.7.1	ERECTION	35%
51.7.2	ALIGNMENT	5%
51.7.3	WELDING	38%
51.7.4	NDT	10%
51.7.5	HYDRAULIC TEST	5%
51.7.6	PAINTING COMPLETION	5%
51.7.7	AS BUILT DRAWING SUBMISSION	2%
51.8	**Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of ACW piping / DMCW piping / Plant Water piping / Service and Portable water piping / Condensate Transfer System / DM make-up water system (CARBON STEEL PIPING (ALL SIZES BELOW AND UP TO 150 NB) and associated material (covering fittings and valves etc) as per tender.**	
51.8.1	ERECTION	35%
51.8.2	ALIGNMENT	5%
51.8.3	WELDING	38%
51.8.4	NDT	10%
51.8.5	HYDRAULIC TEST	5%
51.8.6	PAINTING COMPLETION	5%
51.8.7	AS BUILT DRAWING SUBMISSION	2%
51.9	**Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of SS (STAINLESS STEEL) LP PIPING SYSTEM (CONDENSATE TRANSFER/ DMCW ETC) - FOR DIA UP TO 350 NB) and associated material (including fitting and valves etc) as per tender.**	
51.9.1	ERECTION	35%
51.9.2	ALIGNMENT	5%
51.9.3	WELDING	38%
51.9.4	NDT	10%
51.9.5	HYDRAULIC TEST	10%
51.9.6	AS BUILT DRAWING SUBMISSION	2%
51.10	**Handling from storage, erection, welding/ jointing, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of instrument air and service air system (UP TO 150 NB GALVANISED & THREADED) and associated material (including fitting and valves etc) as per tender.**	
51.10.1	ERECTION	35%
51.10.2	ALIGNMENT	5%
51.10.3	JOINTING	38%
51.10.4	NDT	10%
51.10.5	PNEUMATIC TEST	10%
51.10.6	AS BUILT DRAWING SUBMISSION	2%
51.11	**Handling from storage, erection, welding, inspection, fixing/ embedding, painting etc of FLOW ELEMENT etc. all Complete**	
51.11.1	ERECTION	60 %
51.11.2	ALIGNMENT	35 %
51.11.3	PAINTING COMPLETION	3%
51.11.4	AS BUILT DRAWING SUBMISSION	2%
51.12	**Fabrication of mitre bends, tees of sizes NB 250 and above for various carbon steel LP piping systemetc from straight pipes. Straight pipes will be supplied by BHEL free.**	
51.12.1	FABRICATION	95%
51.12.2	ERECTION	5%
51.13	**Laying and necessary connection of all type pipes including fitting of flanges, nozzles, nuts bolts, stud nuts, gaskets, pipe fittings, connecting required valves and nozzles as per drawing etc. as required for completion of Piping System for following sizes of Pipes of 'Fire Protection system'. PIPE SIZES UPTO 80 NB & PIPE SIZES BEYOND 80 NB**	
51.13.1	ERECTION	35%
51.13.2	ALIGNMENT	5%
51.13.3	WELDING	38%
51.13.4	NDT	10%
51.13.5	HYDRAULIC TEST	5%
51.13.6	PAINTING COMPLETION	5%

51.13.7	AS BUILT DRAWING SUBMISSION	2%
51.14	**Wrapping of burried pipe covering supply and application of wrapping coating material (4mm) including surface preparation by shot blasting of burried pipe as per tender specification, drawing/document and as per BHEL instruction. (Qty indicated is surface area of buried pipe in sq mtr).**	
51.14.1	SUPPLY	80%
51.14.2	APPLICATION	20%
51.15	**Wrapping of burried pipe of Fire Fighting and Fire protection system with the application of wrapping coating material as per tender specification, drawing/document and as per BHEL instruction. (Qty indicated is surface area of buried pipe in sq mtr).** **(Wrapping coating materials shall be supplied by BHEL at free of cost)**	
51.15.1	APPLICATION	100%
51.16	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.	
51.17	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. Since, the tender is for execution of balance jobs, the balance works for the partly erected components shall be carried out by the bidder as per instruction of BHEL engineer and payment shall be made as per the rate derived from total quoted price and further percentage breakup mentioned in clause no 51.6,51.7,51.8,51.9,51.10,51.11,51.12,51.13,51.14,51.15	
51.18	EXTRA WORK CHARGES FOR RECTIFICATION/ MODIFICATION	
	As per provision of G.C.C	
51.18.1	No PVC, rate revision, over run charge/ compensation is applicable for extra works.	
51.18.2	Bills against Extra work covered under clause 51.18 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.	
51.18.3	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.	
52.3	Guarantee for the work already executed by previous existing contractor, shall also be the responsibility of the new bidder. Thus Guarantee of the entire package shall become the responsibility of new bidder.	
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” time schedule indicated vide tender clause no. 28.5.2 . Milestone “M2” time schedule indicated vide tender clause no. 28.5.8 .	
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 required to be withheld on account of slippage of above mentioned intermediate milestone shall be withheld from the respective bills where the specific intermediate milestone activity is coming into picture as per payment terms. Balance withheld 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.
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.
54.0	**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), BHEL shall have the right to recover as liquidated damages (LD) a sum equivalent to 0.5% of the total contract price along with applicable GST, for delay of each week or part thereof. The liability for delay shall not in any case exceed 10% (Ten percent) of the contract price.
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	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.
54.4	BHEL reserve the right to cancel the order/ contract or a portion thereof for the part not so delivered ,at your risk & cost and successful bidder shall be liable to BHEL for any excess costs thereof.
54.5	Successful bidder shall continue performance of the order/ contract under all circumstances, to the extent not cancelled.
54.6	Where action is taken as per above, successful bidder shall be liable for any loss, which BHEL may sustain on that account. Successful bidder shall not be entitled to any gain on such purchase and the manner and the method of such purchase shall be at the discretion of BHEL. It shall not be obligatory on any part of BHEL to serve a notice of such purchase on successful bidder.
Notes:	Maximum LD restricted to 10% of Contract Value.
55.0	**CONTRACT PRICE**
55.1	The bidder shall quote their total price strictly in accordance with prescribed Price schedule of Volume-III.
55.2	The unit rate derived for various items of BOQ ,by apportioning the total quoted price, shall include all the stipulation mentioned in the tender documents and nothing extra over BOQ rates shall be payable.
55.3	Total price for the tendered scope of work ,will be considered for evaluation and awarding.
55.4	The quantities of the various items mentioned in Price Schedule- Volume-III is approximate, based on very preliminary information and may vary to any extent or be deleted altogether. Rates of each item, as derived by apportioning of the total price 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.
55.5	However, the contractor shall inform BHEL in case quantity variation of any item crosses + 50% (plus fifty percent) limit during execution and obtain approval/consent of BHEL for execution of further quantity for this item.
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	**DELETED**
60.0	**INTERESTED BEARING RECOVERABLE ADVANCE/ MOBILISATION ADVANCE**
	NOT APPLICABLE FOR THIS TENDER.

APPENDIX – I

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	EOT Crane	01 No	On sharing basis as per requirement and availability during the execution period .
02	Crane of Adequate Capacity	01 No	On sharing basis for ACW Underground Piping as per requirement and 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 – II

MAJOR TOOLS AND PLANTS & MMDs TO BE DEPLOYED BY THE CONTRACTOR WITHIN QUOTED RATES

A: TOOL & PLANTS

Sl.No.	Description	Quantity	Deployment period/ Remarks
01.	12MT /14 MT New Generation Hydra Crane or equivalent	4 no	2 nos within 20 days. 3rd , within 30 days. Balance 1 nos within 45 days.
02.	Electro Hydraulic Pipe bending m/c	One	As required at site
03.	Trailers with suitable capacity as required	2 nos	1 no within 15 days. 2nd within 30 days.
04.	Welding Generators (Electric as well as Diesel)	50 nos	As required at site
05.	3 Phase complete set up for drawal of Construction Power	As Required	As required at site
06.	Radiography arrangement including source and film viewer	--do--	As required at site
07.	TIG Welding Sets	--do--	As required at site
08.	Stress Reliving equipment with Temperature Recorders	--do--	--do--
09.	Electrical Baking Oven (Big)	--do--	--do--
10.	Electrical Baking Oven(portable)	--do--	--do--
11.	Deleted	Deleted	Deleted
12.	Vacuum Cleaner (Industrial)	one	As required at site
13.	Portable Pipe Cutting & Bending M/C for bending pipes upto Nb 100 mm.	One	As required at site
14.	Air Compressor	01	As required at site
15.	Step Down Transformer(230 V/24V) with adequate number of lamps of 24 Volts	As required	As required at site
24	Long filler set	As required	As required
25	Spanners/eye bolts/de-shakles	As required	As required
27	Erection/Commissioning Fixtures	As required	As required
28	Scaffolding materials with steel pipes, clamps, GI Sheets, Planks etc.	As required	As required
29	Coat-meter for thickness checking of Paint thickness	01 No.	As required
31	Digital multimeters (3.5 digits)	01 No	
36	Motorised megger (measuring upto 5KV range)	As required	As required
38	Vernier	As required	As required
39	Dial Gauges of different sizes and types as per requirement	As required	As required
40	Micro-Meter (both inside and outside)	As required	As required
41	Welding Rectifiers	As required	As required
42	Chain pulley block of 16 MT	As required	As required
43	Chain pulley blocks of other capacities	As required	
44	Pulling & lifting m/c upto 5MT Capacity	As required	As required
45	Multi Sheave pulley upto 100 MT	As required	As required

46	Single Sheave pulley blocks upto 20 MT Capacity	As required	As required
47	Gas cutting torches of different sizes and capacity	As required	As required
48	Grinding Machine	As required (around 20 nos.)	As required
49	Drilling machine	As required (around 20 nos.)	As required
50	Pistol Drilling M/c	As required	As required
51	Wire Rope slings(different sizes)	As required	As required
52	Loose wire ropes (different sizes)	As required	As required
53	Hydraulic jacks with total sets of 25, 10, 5 MT capacity as per requirement	As required	As required
54	Wooden Sleepers	As required	As required
55	NDT test kits as per requirement	As required	As required
56	Lathe machine / Die set for external threading on upto 150 Nb GI pipe	1 no	As required
57	Steel Tapes of different sizes as per requirement	As required	As required
58	Plumb Block as per requirement	--do--	--do--
59	Surface Plates of different sizes	As required	As required
60	Straight Edges of different sizes	--do--	--do--
61	Feeler Gauges of different sizes	--do--	--do--
62	Callipers of different sizes as per requirement	--do--	--do--
63	Bolt heating thermocouples	--do--	--do--
64	Magnifying glasses as per requirement	--do--	--do--
65	Piano-wire as per requirement	--do--	--do--
66	Precision water level micro-meter as per requirement	--do--	--do--
67	Parallel and V-blocks as	--do--	--do--
68	Taper wedge as per requirement	--do--	--do--
69	Lead wire as per requirement	--do--	--do--
70	Dial bore indicator as per requirement	--do--	--do--
71	Balancing machine	--do--	--do--
72	Thermometer of different ranges	--do--	--do--
73	Depth gauges as per requirement	--do--	--do--
74	Vernier Callipers of different sizes as per requirement	--do--	--do--
75	GO and No Go Gauge as per requirement	--do--	--do--
76	Drill Sets as per requirement	--do--	--do--
77	Taps and die sets as per requirement	--do--	--do--
78	Spirit levels as per requirement	--do--	--do--
79	Hg manometer	--do--	--do--
81	Reamers of different sizes as per requirement	--do--	--do--
82	Sand blasting m/c as per requirement	--do--	--do--
83	Spray painting m/c as per requirement	--do--	--do--
86	Slip gauges as per requirement	--do--	--do--
87	MIG Welding Sets as per requirement	--do--	--do--
88	Fillers of different sizes as per requirement	--do--	--do--

89	Allen key/screw driver sets as per requirement	--do--	--do--
90	Files of different sizes as per requirement	--do--	--do--
91	Socket wrench sets as per requirement	--do--	--do--
92	Bench grinders as per requirement	--do--	--do--
93	Belt, Number, Letter punches as per requirement	--do--	--do--
94	Lead, Steel, Test, Wooden, Plastic, Nylon Hammer sets as per requirement	--do--	--do--
95	Fire proof tarpaulins as per requirement	--do--	--do--
96	Pipe Cutters as per requirement	--do--	--do--
97	Rubber, PVC hoses with/without re-enforcement of different sizes as per requirement	--do--	--do--
98	Magnetic base for drilling m/c	--do--	--do--
99	Vibrator and mixer m/c for grouting as per requirement	--do--	--do--
100	Mercury plumb block	--do--	--do--
101	Copper Rods	--do--	--do--
102	All kinds of NDT Test kits as per requirement	--do--	--do--
103	Other T&Ps as per requirement to complete the job.	--do--	--do--
104	Ropes of different sizes and lengths as per requirement	--do--	--do--
106	Hardness testing machine	One no.	--do--
107	PMI machine	One no.	--do--
108	Machining facility comprising of 1 no. lathe machine and 1 no. small shaper machine	As required	--do--
109	20 HP or of suitable capacity (as decided by BHEL) Diesel Pump – minimum 2 nos. for dewatering of inside of piping, low lying areas, in case of inundation etc due to rain/maloperation of various equipment/systems. This facility is to be maintained till handing over.	As required (minimum two nos.)	As required
110	20 HP or of suitable capacity (as decided by BHEL) Electric Pump – minimum 2 nos. for dewatering of inside of piping, low lying areas, in case of inundation etc due to rain/maloperation of various equipment/systems. This facility is to be maintained till handing over.	As required (minimum two nos.)	As required
111	Hydro test pump motorised	As required	As required
112	Pressure gauge	As required	As required
113	Fall arrestor	As required	As required
114	Aluminium ladder	As required	As required
115	Gas detector for confined space	1 no	As required

B: <u>MEASURING AND MONITORING DEVISES (MMD):</u>

AS PER REQUIREMENT TO BE FINALIZED AT SITE.

NOTE :

This above list is only indicative and neither exhaustive nor limiting. Contractor shall deploy all necessary T&Ps to meet the schedules & as prescribed by BHEL	
All T &Ps and all MMDs, 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&Ps 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**
12MT /14 MT New Generation Hydra Crane	Rs.25000/- per week or part there of for each
Electro Hydraulic Pipe bending m/c	Rs.500/- per week or part there of for each
Trailers with suitable capacity	Rs.15000/- per week or part there of for each
Welding Generators (Electric as well as Diesel)	Rs.1000/- per week or part there of for each
All other Items	As per discretion of Engineer

APPENDIX-III

MAJOR CONSUMABLES TO BE PROVIDED BY BHEL FREE OF COST

SL NO	DESCRIPTION OF ITEMS
01	All chemicals (if any, as per site requirement) as required for flushing of pipelines.

APPENDIX-IV

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 /NTPC approved Vendor)
12	Other consumables to complete the job (other than those quantities supplied by BHEL free of cost as per Appendix III

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.

APPENDIX-V

15.2 WELDING DETAILS FOR Hydrant System and Spray system (upto DV):

SRL. No.	Main Header and branch lines - Piping & equipment				
I	**WELD DETAILS FOR PIPES (FIELD PIPING)**	**Units**	**Description**	**Approximate Weld Joints Nos.**	**Type of Weld**
i	80 NB	No	IS-1239 Part-I, MEDIUM GRADE	557	Butt Welds
ii	100 NB	No	IS-1239 Part-I, MEDIUM GRADE	355	Butt Welds
iii	150 NB	No	IS-1239 Part-I, MEDIUM GRADE	1249	Butt Welds
iv	200 NB	No	IS-3589.Grade 410	511	Butt Welds
v	300 NB	No	IS-3589.Grade 410	1320	Butt Welds
vi	400 NB	No	IS-3589.Grade 410	8	Butt Welds
vii	600 NB	No	IS-3589.Grade 410	11	Butt Welds
II	**WELD DETAILS FOR FITTINGS**	**Units**		**Approximate Weld Joints Nos.**	**Type of Weld**
i	250NB	No	FLNG SLIPON IS2062 1" CL150 B16.5 FF	22	Fillet
ii	50 NB	No	FLNG SLIPON IS2062 2" CL150 B16.5 FF	40	Fillet
iii	65 NB	No	FLNG SLIPON IS2062 2 1/2" CL150 B16.5 FF	4	Fillet
iv	80 NB	No	FLNG SLIPON IS2062 3" CL150 B16.5 FF	609	Fillet
v	100 NB	No	FLNG SLIPON IS2062 4" CL150 B16.5 FF	504	Fillet
vi	150 NB	No	FLNG SLIPON IS2062 6" CL150 B16.5 FF	146	Fillet
vii	200 NB	No	FLNG SLIPON IS2062 8" CL150 B16.5 FF	30	Fillet

VIII	250 NB	No	FLNG SLIPON IS2062 10" CL150 B16.5 FF	34	Fillet
IX	300 NB	No	FLNG SLIPON IS2062 12" CL150 B16.5 FF	86	Fillet
X	400 NB	No	FLNG SLIPON IS2062 16" CL150 B16.5 FF	8	Fillet
XI	600 NB	No	FLNG SLIPON IS2062 24" CL150 B16.5 FF	2	Fillet
XII	200 NB	No	FLNG BLIND IS2062 8" CL150 B16.5 FF	0	Fillet
XIII	400 NB	No	FLNG BLIND IS2062 16" CL150 B16.5 FF	0	Fillet
IXV	600 NB	No	FLNG BLIND IS2062 24" CL150 B16.5 FF	0	Fillet
III	**WELD DETAILS FOR FLANGES**	**Units**		**Approximate Weld Joints Nos.**	**Type of Weld**
i	25 NB	No	90 ELBOW	48	Socket
ii	50 NB	No	90 ELBOW	24	Socket
iii	65 NB	No	90 ELBOW	16	Butt Weld
iv	80 NB	No	90 ELBOW	514	Butt Weld
v	100 NB	No	90 ELBOW	312	Butt Weld
vi	150 NB	No	90 ELBOW	1452	Butt Weld
vii	200 NB	No	90 ELBOW	662	Butt Weld
VIII	250 NB	No	90 ELBOW	68	Butt Weld
IX	300 NB	No	90 ELBOW	1720	Butt Weld
X	400 NB	No	90 ELBOW	4	Butt Weld
XI	600 NB	No	90 ELBOW	4	Butt Weld

XII	25 NB	No	EQUAL TEE	24	Socket
XIII	50 NB	No	EQUAL TEE	12	Socket
IXV	80 NB	No	EQUAL TEE	6	Butt Weld
XV	100 NB	No	EQUAL TEE	12	Butt Weld
XVI	150 NB	No	EQUAL TEE	168	Butt Weld
XVII	200 NB	No	EQUAL TEE	30	Butt Weld
XVIII	300 NB	No	EQUAL TEE	135	Butt Weld
IXX	400 NB	No	EQUAL TEE	6	Butt Weld
XX	600 NB	No	EQUAL TEE	6	Butt Weld
XXI	300 NB	No	RED. TEE	15	Butt Weld
XXII	250 NB	No	RED. TEE	21	Butt Weld
XXIII	100 NB	No	RED. TEE	6	Butt Weld
XXIV	300 NB	No	C Reducer	8	Butt Weld
XXV	200 NB	No	C Reducer	8	Butt Weld
XXVI	150 NB	No	C Reducer	8	Butt Weld
XXVII	100 NB	No	C Reducer	8	Butt Weld

APPENDIX-VI

LP PIPING SYSTEM

LP PIPING FOR ACW, DMCW, PLANT WATER, PORTABLE SERVICE WATER, DM MAKE-UP WATER AND CONDENSATE TRANSFER system (SUPPLY OF BHEL PIPING CENTRE, CHENNAI, BHEL TRICHY ETC.) for unit #1, 2, 3 and Auxiliary Boiler

PGMA	WBS Description	material	**Approx. weight (Kg.) FOR EACH UNIT**
FOR BOILER UNIT # 1, 2 & 3			
80-460	SG AUX COOLING WATER UNIT SYSTEM	CS	56,000.00
80-463	TG AUX COOLING WATER	CS	86,000.00
80-468	MAIN CIRCULATION WATER PIPING	CS	130,000.00
80-471	BOILER WATER WASH TO AND FROM UNIT	CS	23,000.00
80-473	DEMINERALISED WATER SYSTEM	SS	11,000.00
80-477	SERVICE WATER PIPING	CS	60,000.00
80-478	DRINKING WATER PIPING	CS	10,000.00
80-480	FIRE WATER-OTHER AREAS	CS	28,000.00
80-604	ACID CLEANING PIPING	CS	190,000.00
80-933	H AND S FOR LP PIPING	CS	22,000.00
FOR AUXILIARY BOILER			
80-460	SG AUX COOLING WATER UNIT SYSTEM	CS	800.00
80-473	DEMINERALISED WATER SYSTEM	SS	650.00
FOR COMMON SYSTEM			
80-473	DEMINERALISED WATER SYSTEM	SS	34,000.00
80-477	SERVICE WATER PIPING	CS	480,000.00
80-478	DRINKING WATER PIPING	CS	17,000.00
80-610	SERVICE AIR-COMP SUCT AND DIS TO RECEI	CS	19,000.00
80-614	INST AIR COMP SUC AND DIS TO RECEIVER	CS	15,000.00
80-933	H AND S FOR LP PIPING	CS	10,000.00

DETAILS OF TENTATIVE DIMENSIONS AND PRODUCT CATEGORY OF LP PIPES.

CUST NOs	PG	MA	DU	MARK NO./DESCRIPTION	QUANTITY	UNIT	WEIGHT (KG).
7245	80	460	001	PIPE 273.1 X 6.4 EP STY "D"260.3	50.000	M	2,104.500
7245	80	460	002	PIPE 219.1 X 6.4 EP STY D 206.3	420.000	M	14,099.400
7245	80	460	003	PIPENB150X5.4BLHEAVYPLAINEND IS1239 BL	500.000	M	10,600.000
7245	80	460	004	PIPENB100X5.4BLHEAVYPLAINEND IS1239 BL	140.000	M	2,016.000
7245	80	460	005	PIPE NB80X 4.8 BLHEAVYPLAINEND IS1239 BL	750.000	M	7,575.000
7245	80	460	006	PIPEN B50X4.50BLHEAVYPLAINEND IS1239 BL	630.000	M	3,887.100
7245	80	460	007	PIPENB40X 4.0 BLHEAVYPLAINEND IS1239	200.000	M	886.000

				BL			
7245	80	460	008	PIPENB25X4.0 BLHEAVYPLAINEND IS1239 BL	790.000	M	2,346.300
7245	80	460	009	PIPENB15X 3.2 BLHEAVYPLAINEND IS1239 BL	325.000	M	471.250
7245	80	412		BOILER & DEAERATOR INITIAL FILLING LINE			
7246	80	460	001	PIPE 273.1 X 6.4 EP STY "D"260.3	50.000	M	2,104.500
7246	80	460	002	PIPE 219.1 X 6.4 EP STY D 206.3	420.000	M	14,099.400
7246	80	460	003	PIPENB150X5.4BLHEAVYPLAINEND IS1239 BL	500.000	M	10,600.000
7246	80	460	004	PIPENB100X5.4BLHEAVYPLAINEND IS1239 BL	140.000	M	2,016.000
7246	80	460	005	PIPE NB80X 4.8 BLHEAVYPLAINEND IS1239 BL	750.000	M	7,575.000
7246	80	460	006	PIPEN B50X4.50BLHEAVYPLAINEND IS1239 BL	630.000	M	3,887.100
7246	80	460	007	PIPENB40X 4.0 BLHEAVYPLAINEND IS1239 BL	200.000	M	886.000
7246	80	460	008	PIPENB25X4.0 BLHEAVYPLAINEND IS1239 BL	790.000	M	2,346.300
7246	80	460	009	PIPENB15X 3.2 BLHEAVYPLAINEND IS1239 BL	325.000	M	471.250
7246	80	412		BOILER & DEAERATOR INITIAL FILLING LINE			
7247	80	460	001	PIPE 273.1 X 6.4 EP STY "D"260.3	50.000	M	2,104.500
7247	80	460	002	PIPE 219.1 X 6.4 EP STY D 206.3	420.000	M	14,099.400
7247	80	460	003	PIPENB150X5.4BLHEAVYPLAINEND IS1239 BL	500.000	M	10,600.000
7247	80	460	004	PIPENB100X5.4BLHEAVYPLAINEND IS1239 BL	140.000	M	2,016.000
7247	80	460	005	PIPE NB80X 4.8 BLHEAVYPLAINEND IS1239 BL	750.000	M	7,575.000
7247	80	460	006	PIPEN B50X4.50BLHEAVYPLAINEND IS1239 BL	630.000	M	3,887.100
7247	80	460	007	PIPENB40X 4.0 BLHEAVYPLAINEND IS1239 BL	200.000	M	886.000
7247	80	460	008	PIPENB25X4.0 BLHEAVYPLAINEND IS1239 BL	790.000	M	2,346.300
7247	80	460	009	PIPENB15X 3.2 BLHEAVYPLAINEND IS1239 BL	325.000	M	471.250
7247	80	412		BOILER & DEAERATOR INITIAL FILLING LINE			
7246	80	463	001	PIPE NB15X 3.2 BL EP STY-D; D1-15.9	50.000	M	72.500
7246	80	463	002	PIPE NB25X4.0 BL EP STY-D; D1-26.9	100.000	M	297.000
7246	80	463	003	PIPE NB50X4.50 BL EP STY-D; D1-52.7	100.000	M	617.000
7246	80	463	004	PIPE NB80X 4.8 BL EP STY-D; D1-80.8	60.000	M	606.000
7246	80	463	005	PIPE NB100X5.4 BL EP STY-D; D1-105.3	60.000	M	864.000
7246	80	463	006	PIPE NB150X5.4 BL EP STY-D; D1-156.8	180.000	M	3,816.000
7246	80	463	007	PIPE OD219.1 X 6.0 EP STY-D; D1-207.1	60.000	M	1,891.800
7246	80	463	008	PIPE OD273.1 X 6.0 EP STY-D; D1-261.1	130.000	M	5,135.000
7246	80	463	009	PIPE OD323.9X6.0 EP STY-D; D1-312	125.000	M	5,875.000

7246	80	463	010	PIPE 406.4X6 EP STY-D; D1-394.4	225.000	M	13,329.000
7246	80	463	011	PIPE 457.0X6 EP STY-D; D1-445	45.000	M	3,002.400
7246	80	463	014	PIPE OD711.2 X 8 EP STY-D; D1-695.2	20.000	M	2,774.000
7245	80	468	001	PIPE OD1422X14-UG-IS3589-410MPA-EP-D1394	320.000	M	155,552.000
7245	80	468	002	PIPE OD1422X14-OG-IS3589-410MPA-EP-D1394	60.000	M	29,166.000
7245	80	468	003	PIPE OD1118X10-UG-IS3589-410MPA-EP-D1098	130.000	M	35,519.900
7245	80	468	004	PIPE OD1118X10-OG-IS3589-410MPA-EP-D1098	10.000	M	2,732.300
7245	80	468	005	PIPE OD813X8-UG-IS3589-410MPA-EP-D/797	1,220.000	M	193,736.000
7245	80	468	006	PIPE OD813X8-OG-IS3589-410MPA-EP-D/797	150.000	M	23,820.000
7245	80	468	007	PIPE 406.4X6-OG EP STY-D; D1-394.4	50.000	M	2,962.000
7245	80	468	008	PIPE 355.6X8 -OG EP STY-D; D1-339.6	20.000	M	1,370.000
7245	80	468	011	PIPE OD273.1 X 6-OG EP-STY-D-D1-261.3	30.000	M	1,185.000
7245	80	468	044	PIPE OD813X8-UG-IS3589-410MPA-EP-D/797	430.000	M	68,284.000
7245	80	471	001	PIPE OD406.4X6.0 EP STY 'D' D1=394.4	180.000	M	10,663.200
7245	80	471	002	PIPE OD323.9X6.0 EP STY 'D' D1=318.9	20.000	M	940.000
7245	80	471	003	PIPE NB150 EP STY'D'D1-156.8	110.000	M	2,332.000
7245	80	471	004	PIPE NB25X4.0 BLACK EP STY 'D' D1=26.9	175.000	M	519.750
7245	80	471	020	PIPE OD219.1X6.0 EP STY D D1=207.0	20.000	M	630.600
7245	80	471	021	PIPE NB40X4.0	35.000	M	155.050
7245	80	471	023	PIPE NB15X4.0	20.000	M	29.000
7246	80	471	001	PIPE OD406.4X6.0 EP STY 'D' D1=394.4	180.000	M	10,663.200
7246	80	471	002	PIPE OD323.9X6.0 EP STY 'D' D1=318.9	20.000	M	940.000
7246	80	471	003	PIPE NB150 EP STY'D'D1-156.8	110.000	M	2,332.000
7246	80	471	004	PIPE NB25X4.0 BLACK EP STY 'D' D1=26.9	175.000	M	519.750
7246	80	471	020	PIPE OD219.1X6.0 EP STY D D1=207.0	20.000	M	630.600
7246	80	471	021	PIPE NB40X4.0	35.000	M	155.050
7246	80	471	023	PIPE NB15X4.0	20.000	M	29.000
7247	80	471	001	PIPE OD406.4X6.0 EP STY 'D' D1=394.4	180.000	M	10,663.200
7247	80	471	002	PIPE OD323.9X6.0 EP STY 'D' D1=318.9	20.000	M	940.000
7247	80	471	003	PIPE NB150 EP STY'D'D1-156.8	110.000	M	2,332.000
7247	80	471	004	PIPE NB25X4.0 BLACK EP STY 'D' D1=26.9	175.000	M	519.750
7247	80	471	020	PIPE OD219.1X6.0 EP STY D D1=207.0	20.000	M	630.600
7247	80	471	021	PIPE NB40X4.0	35.000	M	155.050
7247	80	471	023	PIPE NB15X4.0	20.000	M	29.000
7245	80	480	001	PIPE OD406.4X6.0 EP STY 'D' D1=394.4	135.000	M	7,997.400
7245	80	480	002	PIPE OD323.9X6.0 EP STY 'D' D1=318.9	18.000	M	846.000
7245	80	480	003	PIPE NB80X 4.8 EP STY "D"D1-80.3	1,100.000	M	10,835.000
7245	80	480	004	PIPE NB25X4.0 BLACK EP STY 'D' D1=26.9	360.000	M	1,069.200
7245	80	480	020	PIPE OD219.1X6.0 EP STY D D1=207.0	20.000	M	630.600
7245	80	480	021	PIPE NB40X4.0	290.000	M	1,284.700
7245	80	480	023	PIPE NB15X4.0	20.000	M	29.000
7245	80	480	028	PIPE NB 50 IS1239 HEAVY BL	150.000	M	925.500
7246	80	480	001	PIPE OD406.4X6.0 EP STY 'D' D1=394.4	135.000	M	7,997.400

7246	80	480	002	PIPE OD323.9X6.0 EP STY 'D' D1=318.9	18.000	M	846.000
7246	80	480	003	PIPE NB80X 4.8 EP STY "D"D1-80.3	1,100.000	M	10,835.000
7246	80	480	004	PIPE NB25X4.0 BLACK EP STY 'D' D1=26.9	360.000	M	1,069.200
7246	80	480	020	PIPE OD219.1X6.0 EP STY D D1=207.0	20.000	M	630.600
7246	80	480	021	PIPE NB40X4.0	290.000	M	1,284.700
7246	80	480	023	PIPE NB15X4.0	20.000	M	29.000
7246	80	480	028	PIPE NB 50 IS1239 HEAVY BL	150.000	M	925.500
7247	80	480	001	PIPE OD406.4X6.0 EP STY 'D' D1=394.4	135.000	M	7,997.400
7247	80	480	002	PIPE OD323.9X6.0 EP STY 'D' D1=318.9	18.000	M	846.000
7247	80	480	003	PIPE NB80X 4.8 EP STY "D"D1-80.3	1,100.000	M	10,835.000
7247	80	480	004	PIPE NB25X4.0 BLACK EP STY 'D' D1=26.9	360.000	M	1,069.200
7247	80	480	020	PIPE OD219.1X6.0 EP STY D D1=207.0	20.000	M	630.600
7247	80	480	021	PIPE NB40X4.0	290.000	M	1,284.700
7247	80	480	023	PIPE NB15X4.0	20.000	M	29.000
7247	80	480	028	PIPE NB 50 IS1239 HEAVY BL	150.000	M	925.500
7245	80	604	001	PIPE OD406.4X12.7 EP@SHOP STY'D'D1=381.3	30.000	M	3,699.000
7245	80	604	002	PIPE OD323.9X9.53 EP@SHOP STY'D'D1=304.8	30.000	M	2,216.400
7245	80	604	003	PIPE OD273.0X9.27 EP@SHOP STY'D'D1=254.5	2,200.000	M	132,682.000
7245	80	604	004	PIPE OD219.1X8.18 EP@SHOP STY'D'D1=202.7	250.000	M	10,637.500
7245	80	604	005	PIPE OD168.3X7.11 EP@SHOP STY'D'D1=154.1	300.000	M	8,478.000
7245	80	604	006	PIPE OD114.3X6.02 EP@SHOP STY'D'D1=102.3	300.000	M	4,821.000
7245	80	604	007	PIPE OD48.3X5.08 EP @ SHOP STY'D'D1=39.2	300.000	M	1,723.800
7245	80	604	008	PIPE OD21.3X3.73 EP @ SHOP STY'D'D1=14.5	100.000	M	162.000
7277	80	473	001	PIPE DIA 60.3 X 3.91-EP-STY-D;D1=53.2	125.000	M	680.000
7277	80	473	002	PIPE OD88.9X3.05 EP-STY-D;D1=82.8	112.000	M	723.520
7277	80	473	003	PIPE OD114.3X3.05 EP-STY-D;D1=108.2	295.000	M	2,469.150
7277	80	473	004	PIPE OD168.3X3.4 EP-STY-D;D1=161.5	200.000	M	2,766.000
7277	80	473	005	PIPE OD219.1X3.76 EP-STY-D;D1=211.6	85.000	M	1,697.450
7277	80	473	006	PIPE OD273.1X4.19 EP-STY-D;D1=264.6	72.000	M	2,000.880
7277	80	473	025	PIPE OD219.1X8.18 EP-STY-D;D1=202.7	90.000	M	3,829.500
7277	80	473	027	PIPE OD323.9X4.57 EP-STY-D;D1=314.8	35.000	M	1,277.500
7277	80	473	034	PIPE DIA 33.4 X 3.38 SA312TP304H	100.000	M	250.000
7277	80	473	035	PIPE DIA 21.3 X 2.77 SA312TP304H	50.000	M	63.500
7277	80	473	044	PIPE OD114.3X3.05 EP;STY-D/108.2 AT SHOP	180.000	M	1,506.600
7277	80	473	045	PIPE OD168.3X3.4 EP-STY-D/161.5 AT SHOP	500.000	M	6,915.000
7277	80	473	046	PIPE OD219.1X3.76 EPSTY-D/211.6 AT SHOP	150.000	M	2,995.500
7277	80	473	047	PIPE OD273.1X4.19 EPSTY-D/264.6 AT SHOP	250.000	M	6,947.500
7277	80	473	052	PIPE OD273.1X4.19	200.000	M	5,558.000
7277	80	473	053	PIPE OD273.1X6.35 EPSTY-D/264.6 AT	100.000	M	4,177.000

				SHOP			
7277	80	477	001	PIPE NB25X4.0 BL-OG EP STY-D; D1-26.9	500.000	M	1,485.000
7277	80	477	002	PIPENB40X 4.0-OG EP STY-D; D1-41.5	100.000	M	443.000
7277	80	477	003	PIPE NB50X4.50 -OG EP STY-D; D1-52.7	500.000	M	3,085.000
7277	80	477	004	PIPE NB80X 4.8 -OG EP STY-D; D1-80.8	1,500.000	M	15,150.000
7277	80	477	005	PIPE NB150X5.4 -OG EP STY-D; D1-156.8	150.000	M	3,180.000
7277	80	477	006	PIPE OD219.1X6.4-OG EP STY-D; D1-206.3	1,400.000	M	46,998.000
7277	80	477	007	PIPE OD273.1X6.35-OG-EP STY-D; D1-260.4	60.000	M	2,505.000
7277	80	477	008	PIPE OD323.9X6.35-OG-EP STY-D; D1-311.2	100.000	M	4,973.000
7277	80	477	009	PIPE OD 406.4X6-OG EP STY-D; D1-394.4	1,200.000	M	71,088.000
7277	80	477	010	PIPE OD 457X6.4-OG EP STY-D; D1-445	30.000	M	2,133.600
7277	80	477	011	PIPE 508 X6.4 -OG EP STY-D; D1-496	15.000	M	1,187.400
7277	80	477	020	PIPE NB50X4.50 -OG EP STY-D; D1-52.7	1,000.000	M	6,170.000
7277	80	477	021	PIPE NB80X 4.8 -OG EP STY-D; D1-80.8	1,000.000	M	10,100.000
7277	80	477	022	PIPE NB100X5.4 -OG EP STY-D; D1-105.3	910.000	M	13,104.000
7277	80	477	023	PIPE OD219.1X6.4-OG EP STY-D; D1-206.3	400.000	M	13,428.000
7277	80	477	024	PIPE OD323.9X6.35-OG-EP STY-D; D1-311.2	640.000	M	31,827.200
7277	80	477	025	PIPE OD 406.4X6-OG EP STY-D; D1-394.4	900.000	M	53,316.000
7277	80	477	026	PIPE 508 X6.4 -OG EP STY-D; D1-496	20.000	M	1,583.200
7277	80	477	027	PIPE OD219.1X8.18 L=600M,EP'D'202.7	600.000	M	25,530.000
7277	80	477	030	PIPENB25X4.0 BLHEAVYD1=26.9-IS1239	500.000	M	1,485.000
7277	80	477	031	PIPENB40X4.0 BLHEAVYD1=41.5 IS1239 BL	200.000	M	886.000
7277	80	478	001	PIPENB 25X4.0 SCREW&SOCKETED IS1239 GAL	250.000	M	747.500
7277	80	478	002	PIPENB 80X 4.8 SCREW&SOCKETED IS1239 GAL	2,200.000	M	22,660.000
7277	80	478	003	PIPENB 40X 4.0 SCREW&SOCKETED IS1239 GAL	1,000.000	M	4,470.000
7277	80	610	001	PIPENB 150X5.4SCREW&SOCKETED IS1239 GAL	1,000.000	M	21,900.000
7277	80	610	002	PIPENB 50X4.5 SCREW&SOCKETED IS1239 GAL.	250.000	M	1,560.000
7277	80	610	003	PIPENB 25X4.0 SCREW&SOCKETED IS1239 GAL	1,250.000	M	3,737.500
7277	80	610	007	PIPENB 80X 4.8 SCREW&SOCKETED IS1239 GAL	65.000	M	669.500
7277	80	610	008	PIPENB 40X 4.0 SCREW&SOCKETED IS1239 GAL	1,000.000	M	4,470.000
7277	80	614	001	PIPENB 100X5.4SCREW&SOCKETED IS1239 GAL	500.000	M	7,350.000
7277	80	614	002	PIPENB 50X4.5 SCREW&SOCKETED IS1239 GAL.	100.000	M	624.000
7277	80	614	003	PIPENB 40X4.0 SCREW&SOCKETED IS1239 GAL	50.000	M	223.500
7277	80	614	006	PIPENB 150X5.4SCREW&SOCKETED IS1239 GAL	600.000	M	13,140.000

LP PIPING FOR PLANT FIRE WATER SYSTEM.

A	PIPING AND ACCESSORIES RELATED TO FIRE WATER PUMP HOUSE EQUIPMENT	Unit	Qty	Mass/Mtr or Unit Weight in KGS	Total Mass (T) (Tonnes)	Dimensions (L x B x H) in Meters/Remarks
1	Cast Iron Gate Valve					
i	Size 600 mm NB	NOS	2	1,232	2.96	
ii	Size 400 mm NB	NOS	1	518	0.52	
iii	Size 300 mm NB	NOS	9	304	2.74	
iv	Size 250 mm NB	NOS	9	200	1.80	
v	Size 200 mm NB	NOS	9	126	1.13	
vi	Size 150 mm NB	NOS	2	77	0.17	
vii	Size 100 mm NB	NOS	6	44	0.26	
2	Butterfly valve					
i	Size 300 mm NB	NOS	6	62	0.34	
ii	Size 200 mm NB	NOS	2	26	0.06	
3	Cast Iron Non Return Valve					
i	Size 400 mm NB	NOS	1	518	0.57	
ii	Size 300 mm NB	NOS	1	304	0.33	
iii	Size 250 mm NB	NOS	9	200	1.80	
iv	Size 150 mm NB	NOS	2	126	0.28	
v	Size 100 mm NB	NOS	4	77	0.34	
4	Struructural Steel	LOT	1	3000	3.00	
5	Flanges, nut bolt & gasket	LOT	1			
6	M.S. Pipe - 600 NB	Mtrs.	78	93.8	7.32	
ii	M.S. Pipe - 400 NB	Mtrs.	48	62.2	2.99	
iii	M.S. Pipe - 300 NB	Mtrs.	67	55.0	3.70	
iv	M.S. Pipe - 250 NB	Mtrs.	50	41.0	2.07	
v	M.S. Pipe - 200 NB	Mtrs.	72	33.0	2.38	
v	M.S. Pipe - 100 NB	Mtrs.	36	14.5	0.52	Mild steel as per IS:1239 (Part-I) medium grade
vi	M.S. Pipe - 65 NB	Mtrs.	36	9.9	0.36	Mild steel as per IS:1239 (Part-I) medium grade
vii	M.S. Pipe - 50 NB	Mtrs.	36	4.5	0.16	Mild steel as per IS:1239 (Part-I) medium grade
7	Pipe Fittings	LOT	1	2,000.0	2.00	

	Total Tonnage for FWPH Piping				**37.80 MT**	
B	**Hydrant System and Spray system (upto DV) :: Main Header and branch lines - Piping & Accessories**	**Unit**	**Qty**	**Mass/Mtr**	**Total Mass (T) (Tonnes)**	
1	**UG Pipes:: Pipes upto 150 NB IS:1239 Part-I and above 150 NB IS:3589**					
i	300 NB	Mtrs	7,300	55.0	401.50	
ii	250 NB	Mtrs	900	41.0	36.90	
iii	200 NB	Mtrs	1500	33.0	49.50	
iv	150 NB	Mtrs	6708	21.3	142.88	
v	100 NB	Mtrs	2350	14.5	34.08	
vi	80 NB	Mtrs	1400	9.9	13.86	
2	**AG Pipes:: Pipes upto 150 NB IS:1239 Part-I and above 150 NB IS:3589**					
i	300 NB	Mtrs	7000	55.0	385.00	
ii	250 NB	Mtrs	500	41.0	20.50	
iii	200 NB	Mtrs	2200	33.0	72.60	
iv	150 NB	Mtrs	2500	21.3	53.25	
v	100 NB	Mtrs	1700	14.5	24.65	
vi	80 NB	Mtrs	1500	9.9	14.85	
vii	50 NB	Mtrs				
3	**Single headed 63 mm dia hydrant landing valve**					
i	External	Nos	339	20	6.78	
4	**Branch Pipes and nozzles (triple purpose nozzle)**					
i	Branch Pipes and nozzles (triple purpose nozzle)	Nos	279	10	2.79	
5	**Wrapping & Coating**	Sq.M	2,000			
6	**Cast Iron Gate Valves in FWPH, Hydrant Header and FEH**	Unit				
i	15 NB GATE VALVE	Nos	10	3.00	0.03	
ii	25 NB GATE VALVE	Nos	10	5.43	0.05	
iii	50 NB GATE VALVE	Nos	11	15.17	0.17	
iv	80 NB GATE VALVE	Nos	2	27.00	0.05	
v	100 NB GATE VALVE	Nos	6	44.00	0.26	
vi	150 NB GATE VALVE	Nos	80	77.00	6.16	

vii	200 NB GATE VALVE	Nos	6	126.00	0.76
viii	250 NB GATE VALVE	Nos	4	200.00	0.80
ix	300 NB GATE VALVE	Nos	24	304.00	7.30
7	**Butterfly valve**				
i	150 NB	Nos	40	16.00	0.64
8	**Pipe Fittings (Including FWPH & Booster PH Fittings)**	Lot	1	55000	55.00
9	**Flanges, nut bolt & gasket (Including FWPH & Booster PH)**	Lot	1	10000	10.00
10	**Struructural Steel**	LOT	1	35000	35
	Total Tonnage for Hydrant & Spray System piping upto Deluve valve				**1,375.36**
C	**MEDIUM VELOCITY WATER SPRAY SYSTEM (For Conveyors, Cable Galleries, Transfer Points, Fuel Tanks, Crusher House, Wagon Tippler etc.)**	**Unit**	**Qty**	**Mass/Mtr**	**Total Mass (T) (Tonnes)**
1	**MS ERW Galvanized to IS:1239,Part-1, Galvanized as per IS: 4736 upto 150 NB**				
i	150 NB	Mtrs.	2237	21	48
ii	100 NB	Mtrs.	5544	15	80
iii	80 NB	Mtrs.	545	10	5
iv	65 NB	Mtrs.	1753	8	14
v	50 NB	Mtrs.	8446	6	52
vi	40 NB	Mtrs.	8517	4	37
vii	25 NB	Mtrs.	11033	3	32
2	**25 NB ERW PIPE from Deluge Valve to spray line**	Mtrs.	2280	15	34
3	**Cast iron Rising spindle Type Gate Valve**				-
i	150 NB	Nos.	44	76	3
ii	100 NB	Nos.	304	44	13
iii	80 NB	Nos.	2	27	0.06
4	**Cast iron wafer Butterfly Valve**				-
i	150 NB	Nos.	-		-
ii	100 NB	Nos.	-		-

iii	80 NB	Nos.	-		-
5	**Cast iron Deluge Valve (wet pilot) complete with necessary trim, water gong**				-
i	150 NB	Nos.	20	151	3
ii	100 NB	Nos.	138	97	13
iii	80 NB	Nos.	1	70	0.07
6	**M.S Y- Type Strainer**				-
i	150 NB	Nos.	20	40	1
ii	100 NB	Nos.	138	25	3
iii	80 NB	Nos.	1	20	0
7	**Spray Nozzle - Stainless Steel**	No			-
i	K-18	No	96	0.125	0.01
ii	K-22	No	210	0.125	0.03
iii	K-30	No	6321	0.125	1
iv	K-35	No	1143	0.125	0.14
v	K-41	No	1435	0.125	0.18
vi	K-51	No	23	0.125	0.00
vii	K-64	No	396	0.125	0.05
viii	K-79	No	128	0.125	0.02
8	**15 NB Solenoid Valve**	No	159		-
9	**SS orifice plate**				-
i	150 NB	No	22	2	0.04
ii	100 NB	No	152	1.5	0.23
iii	80 NB	No	1	1	0.00
10	**Structural Steel**	Lot	1	75000	75
11	**Pipe Fittings, Flanges, Studnuts & gaskets**	Lot	1	50000	50
12	**Cast Iron Rising Spindle Type Gate Valve - IS : 14846**	Lot	1		-
i	150 NB	No	18	76	1
ii	100 NB	No	236	44	10
iii	80 NB	No	2	27	0.05
	Total Tonnage for WVWS System from downstream of Deluge Valve incld. DV				**475.88**

D	**HIGH VELOCITY WATER SPRAY SYSTEM (ST, SAT, UAT & UT TRANSFORMERS, BOILER BURNER, LUBE OIL CONSOLE, BFP LUBE OIL, TURBINE LUBE OIL)**	**Unit**			
1	**ERW G.I. Pipe as Per IS:1239 Heavy Class**				
i	150 NB	Mtrs.	1168	21	24.88
ii	100 NB	Mtrs.	1640	15	23.78
iii	80 NB	Mtrs.	388	10	3.84
iv	65 NB	Mtrs.	992	8	7.86
v	50 NB	Mtrs.	3341	6	20.68
vi	40 NB	Mtrs.	1962	4	8.57
vii	32 NB	Mtrs.	931	4	3.72
viii	25 NB	Mtrs.	1203	3	3.61
2	**ERW, MS black pipe as Per IS:1239 Heavy Class**				
i	80 NB	Mtrs.	792	10	7.84
ii	65 NB	Mtrs.	347	8	2.75
iii	50 NB	Mtrs.	1812	6	11.21
iv	40 NB	Mtrs.	323	4	1.41
v	25 NB	Mtrs.	10519	3	31.56
3	**Cast iron Rising spindle Type Gate Valve**				
i	150 NB	Nos.	13	76	1.01
ii	100 NB	Nos.	114	44	5.02
iii	80 NB	Nos.	0	27	
4	**Cast iron wafer Butterfly Valve**				
i	150 NB	Nos.	-		
ii	100 NB	Nos.	-		
iii	80 NB	Nos.	0		
5	**Cast iron Deluge Valve (wet pilot) complete with necessary trim, water gong**				
i	150 NB	Nos.	6	151	0.91
ii	100 NB	Nos.	52	97	5.04
iii	80 NB	Nos.	-		
6	**M.S Y- Type Strainer**				
i	150 NB	No	6	58	0.35
ii	100 NB	No	52	47	2.44

iii	80 NB	No			
7	**Spray Nozzle - Stainless Steel**	No			
i	K-23 Angle - 120	No	2797	0.250	0.70
ii	K-26 Angle - 100	No	343	0.250	0.09
iii	K-42 Angle - 115	No	119	0.250	0.03
8	**15 NB Solenoid Valve**	No	-		
9	**SS orifice plate**				
i	150 NB	Nos.	7	2	0.01
ii	100 NB	Nos.	57	1.5	0.09
iii	80 NB	Nos.			
10	**Structural Steel**	Lot	1	30000	30.00
11	**Pipe Fittings, Flanges, Studnuts & gaskets**	Lot	1	35000	35.00
12	**Cast Iron Rising Spindle Type Gate Valve - IS : 14846**	Lot			
i	150 NB	No	13	76	1.01
ii	100 NB	No	31	44	1.35
iii	80 NB	No	2	27	0.06