

**VOLUME – 2, SECTION – A**  
**TECHNICAL SPECIFICATION**  
**GENERAL TECHNICAL REQUIREMENTS**

For

**Renovation & Modernization**

of

**BPSCL Unit # 1 to 5 (5 × 220 TPH)**



Prepared and submitted by:

**steag**

**STEAG Energy Services India Pvt. Ltd.**



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**JULY 2016**

PROJECT NO.: ETRM012	PROJECT NAME: <b>BPSCL UNIT 1 TO 5 BOILER (220 TPH)</b>	PACKAGE / SYSTEM: <b>GENERAL TECHNICAL REQUIREMENTS</b>
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## REVISIONS

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## 1.0 DURING EXECUTION OF THE CONTRACT

The Contractor shall be obliged to progress the project till completion with the coordination and decision of the Owner's Engineer (implementation /supervision consultant as per the Contract Agreement).

## 2.0 REQUIREMENT OF EXPERTS DURING WARRANTY PERIOD

The Contractor shall, in addition to the compliance of the conditions regarding the defect liability of the equipments supplied as per the requirements of the Technical Specifications, provide the services of the personnel specified hereunder immediately from the date of completion of the Performance Guarantee Test at the project site or from the date of Operational Acceptance, whichever is earlier, as per the Contract Agreement, in order to ensure smooth and trouble free operation of the Unit during the Defect Liability Period.

Two Boiler Experts (1 for Operation and 1 for Maintenance)

One C & I Expert (Operation and Maintenance)

If the Contractor fails to provide the services of the said personnel within seven days from the date of completion of the Performance Guarantee Tests at the project site or from the date of Operational Acceptance, the Owner may, following notice to the Contractor, proceed to arrange the services of the said personnel from his own sources and the reasonable costs as decided and incurred by the Owner in connection therewith shall be paid to the owner by the Contractor or may be deducted by the owner from any amount due to the Contractor.

## 3.0 O&M MANUAL AND AS BUILT DRAWINGS

Contractor shall revise the existing O&M manual as per renovation & modernization. In case of the new system, he shall provide the new document for operation and maintenance of the unit.

Contractor shall furnish final as built drawings after completion of the project.

## 4.0 TRAINING OF THE O&M STAFF OF BPSCL

Contractor shall provide training in the following areas as per Contract Agreement at the site as well as at his works (along with residential facility):

Boiler area, C& I area, and the other balance area under this package.

## 5.0 TERMINAL POINTS FOR R&M PACKAGE

S. No	System	Description		
<b>Steam Generating Units</b>				
1.	Service Water	1 m away from individual equipment in steam generator area.		
2.	Instrument Air and Service Air	1 m away from boiler of Unit – 1 at 8 m level. Bidder shall provide quantity and quality of the compressed air to the owner.		
3.	Cooling Water (CCW)	1 m away from individual equipments in steam generator area.		
4.	HP Steam	Inlet of MSSV		
5.	Water Spray Line for Superheater	1 m tapping from feed water line. All valves in the		
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		scope of Steam Generator package.
6.	Drains	Stub joints from header to blowdown tank.
7.	Boiler Blowdown	Connection of blowdown pipe on the drum
8.	Feed water	About 1 m away from the bottom economizer inlet header at left and right side.
9.	Vents	At safe elevation (1 m above roof)
10.	Coal	10 m from burner inlet.
11.	Fuel Oil	Outlet flange of the first isolating valve from common header for main line & first valve from recirculation header for recirculation line.
12.	BF Gas Pipe	Outlet flange of the BF Gas line isolating valve of each burner. Any new gas pipe, valves and dampers associated with implementation of Gas Firing Controls and its integration with PLC system is under the scope of bidder.
13.	CO Gas Pipe	Tapping point from the common gas header in left and right side of Furnace first pass. Any new gas pipe, valves and dampers associated with implementation of Gas Firing Controls and its integration with PLC system is under the scope of bidder.
14.	Secondary Air Duct	Tapping point from the common secondary air header in left and right side of the furnace first pass. Any new ducting, dampers, expansion bellows and actuators and its interfacing with PLC system is under the scope of bidder.
15.	Flue gas ducting	Outlet of the first compensator of furnace exit.
16.	Atomizing Steam line	Outlet flange of the first isolating valve from common header & first valve from boiler drum for individual line.
17.	Gas purging steam line	Outlet flange of the first valve from the gas purging header in both side at burner floor.

## 6.0 OVERHAULING / RLA STUDY



The overhauling / RLA study for the equipments / components shall be as per systems & procedures recommended by the respective equipment manufacturer / supplier. The applicable procedure along with list of spares required shall be obtained by the Contractor from the Owner. Owner shall make available the regular O&M spares and spares available under the contingency plan, excluding the parts supplied by the contractor under the contract. Contractor shall be responsible for making available all other necessary items/ equipments needed for overhaul like welding transformers, scaffolding, winches, safety nets, etc. and all other consumables like electrodes, gas cylinders, grease etc.. Contractor shall prepare a detailed plan of overhaul in consultation with the Owner's engineer and get it approved in advance, and execute the plan in supervision of the Owner's engineer for timely completion.

## 7.0 SPARES

The Contractor shall provide unit prices of the recommended ~~mandatory~~ spares, the indicative list of which shall be provided to the Contractor.

The prices of recommended spares quoted by the Contractor shall remain valid up to one (1) year from the date of Commissioning and the Owner shall have the right to place the order of spares

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up to one (1) year period from the date of Commissioning at the same price. The prices of all future requirements of spares beyond one (1) year period will be mutually agreed but such prices shall, in no case, be higher than those agreed as per PSU, central govt agency.

## 8.0 SITE ERECTION CONDITIONS OF THE CONTRACT

### 8.1 GENERAL

The following conditions shall supplement the conditions contained in the other Sections and shall govern the portion of the work to be performed at Site.

### 8.2 REGULATION OF LOCAL AUTHORITIES AND STATUTES

8.2.1 The Contractor shall comply with all the rules and regulations of local authorities during the performance of his field activities. He shall also comply with the Minimum Wages Act, 1948, and the payment of Wages Act (issued by Government of India). He shall also comply with all provisions of the factory Act 1948, The Jharkhand Factory rules 1950, Indian Electricity Rules 1956 and other rules and regulations made there under in respect of any employee or workman employed or engaged by him or his sub-contractor shall be strictly adhered to.

8.2.2 All registration and statutory inspection fees, if any, in respect of his work pursuant to this Contract shall be to the account of the Contractor. However, any registration, statutory inspection (like Boiler inspection, Electrical Inspection, IRDA inspection etc. at site) fees lawfully payable by the Owner under the provisions of any statutory laws and its amendments from time to time during erection in respect of the plant equipment ultimately to be owned by the Owner, shall be to the account of the Owner. Should any such inspection or registration need to be rearranged due to the fault of the Contractor or his sub-contractor, the additional fees for such inspection and/or registration shall be borne by the Contractor.

### 8.3 ACCESS TO SITE AND WORKS ON SITE

8.3.1 Suitable access to and possession of the Site shall be afforded to the Contractor by the Owner to enable him to execute the site works.

8.3.2 The Works so far as it is carried out on the Owner's premises, shall be carried out at such time as the Owner may approve.

8.3.3 In the execution of the works, no persons other than the Contractor or his duly appointed representative, sub-contractor and workmen shall be allowed to do work on the Site, except by the special permission, in writing, of the Engineer or his representative.

### 8.4 CONTRACTOR'S SITE OFFICE ESTABLISHMENT

8.4.1 The Contractor upon signing of the Contract shall, in addition to a Project Coordinator stationed at Headquarters, nominate another responsible officer as his resident representative, suitably designated for the purpose of overall responsibility and co-ordination of the works to be performed at Site. Such person shall function from the site office to be established by the Contractor.

8.4.2 Any written order or instruction of the Engineer or his duly authorized representative shall be communicated to the said authorized resident representative of Contractor and the same shall be deemed to have been communicated to the Contractor at its legal address.

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## 8.5 CO-OPERATION WITH OTHER CONTRACTORS

- 8.5.1 The Contractor shall co-operate with all other Contractors or tradesmen of the Owner, who may be performing other works on behalf of the Owner and the workmen who may be employed by the Owner and doing work in the vicinity of the works under the contract. The Contractor shall also so arrange to perform his work as to minimize, to the maximum extent possible, interference with the work of other Contractors and their workmen. Any injury or damage that may be sustained by the employees of the other Contractors and the Owner, due to Contractor's work shall promptly be made good at his own expense. The Engineer shall determine the resolution of any difference or conflict that may arise between the Contractor and other Contractors or between the Contractor and the workmen of the Owner in regard to their work. If the Works of the Contractor is delayed because of any acts or omission of another Contractor, the Contractor shall have no claim against the Owner on that account other than an extension of time for completing his works.
- 8.5.2 Any defects in the other Contractor's work that could affect the Contractor's Works shall be notified promptly to the Owner's Engineer by the Contractor. The Engineer shall determine the corrective measures, if any, required for rectifying this situation after inspection of the Works and such decisions by the Engineer shall be binding on the Contractor.

## 8.6 DISCIPLINE OF WORKMEN

- 8.6.1 The Contractor shall adhere to the disciplinary procedure set by the Engineer in respect of his employees and workmen at Site. The Engineer shall be at liberty to object to the presence of any representative or employee of the Contractor at the site if, in the opinion of the Engineer, such employee has mis-conducted himself or be incompetent or negligent or otherwise undesirable and then the Contractor shall remove such a person objected to and provide in his place a competent replacement.
- 8.6.2 The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct or strikes by or amongst his employees and for preservation of peace and protection of persons and property at and in the neighborhood of works.

## 8.7 CONTRACTOR'S FIELD OPERATION

- 8.7.1 The Contractor shall keep the Engineer informed in advance regarding his field activity plans and schedules for carrying out each part of the works. Any review of such plan or schedule or method of work by the Engineer shall not relieve the Contractor of any of his responsibilities towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the Engineer or the Owner or any of his representatives and no claim of the Contractor will be entertained because of the failure or inefficiency of any such plan or schedule or method of work reviewed. The Contractor shall be solely responsible for the safety, adequacy and efficiency of the plant and the equipment and for his erection methods.

## 8.8 SAFETY AT SITE

- 8.8.1 The Contractor shall have the complete responsibility for the conditions of the work at Site including the safety of all persons employed by him or his subcontractor and all the properties under his custody during the performance of the work. This requirement shall apply continuously till the completion of the Contract and shall not be limited to normal working hours. The construction review by the Engineer is not intended to include review



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of Contractor's safety measures in, or near the work site, and their adequacy or otherwise.



- 8.8.2 All safety rules and codes as applicable to work shall be followed without exception during erection, movement of material etc.
- 8.8.3 The contractor shall provide all safety appliances and protective devices including belts, hand gloves, aprons, helmets, safety shoes, shields, goggles etc. for his personnel. The contractor shall provide guards and prominently display caution notice if access to any equipment/area is considered unsafe and hazardous.
- 8.8.4 To avoid tripping of live unit, the contractor should ensure common Electrical and Mechanical isolation.

### 8.9 FIRST AID

- 8.9.1 The Contractor shall provide necessary first aid facilities for all his employees, representatives and workmen working at the Site. Enough number of Contractor's personnel shall be trained in administering first aid.
- 8.9.2 The Owner will provide the Contractor, in case of an emergency, the services of an ambulance, if available, for transportation to the nearest hospital. The contractor for their labour shall do provision of accident insurance plan.

### 8.10 FIRE PROTECTION

- 8.10.1 The work procedures that are to be used during the erection activities shall be those, which minimize fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the site at least once each day. Fuels, oil and volatile or flammable materials shall be stored in safe containers away from the construction equipment and materials storage areas. Untreated canvas paper, plastic or other flammable materials shall not at all be used at site for any other purpose unless otherwise specified. If any such materials are received with the equipment at the site, the same shall be removed and replaced with acceptable materials before moving into the construction area or storage.
- 8.10.2 Similarly, corrugated paper fabricated cartons, etc., will not be permitted in the construction area either for storage or for handling of materials. All such materials used shall be of water proof and flame resistant type. All other materials such as working drawings, plans, etc. which are combustible but are essential for the works to be executed shall be protected against combustion resulting from welding, sparks, cutting flames, and other similar fire sources.
- 8.10.3 The entire Contractor's supervisory personnel and sufficient number of workers shall be trained for firefighting and shall be assigned specific fire protection duties. Enough number of such trained personnel must be available at the site during the entire period of the Contract.
- 8.10.4 The Contractor shall provide enough fire protection equipment of different types for the warehouses, temporary structures, labour colony area etc. Access to such fire protection equipments, shall be easy and kept open at all times.

		
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## 8.11 PROTECTION OF ENVIRONMENT

8.11.1 The contractor shall ensure that the activities involving Material handling, Erection, Commissioning and testing shall not create any environmental hazards nor will harm in any way to the Environment. All care shall be taken while carrying out commissioning activities that no hazardous waste is decapitated in the nearby environment. All proper procedures regarding the same shall be followed seriously. Contractor shall be solely responsible for any violation on his part regarding Environmental aspects.

## 8.12 WORK TO BE OPEN FOR INSPECTION AND PRESENCE OF CONTRACTOR

8.12.1 All works under or in course of execution or executed under the contract shall at all times be open to the inspection & supervision by Engineer. Contractor shall at all times during the working hours and at other times with notice of Engineer's visit to works shall have responsible representative available to receive instructions from the Engineer. Orders/Instructions given to authorized representative shall be considered as if they are given to the Contractor himself.

8.12.2 Notice before Work is Covered Up

The Contractor shall give adequate notice (normally seven days) to Engineer in writing before boxing up or placing the equipment/works beyond the reach of inspection & measurement. If Contractor covers such works without notice, then Engineer reserves the right to get the same uncovered at the risk & cost of the Contractor.

## 8.13 MANPOWER REPORT

8.13.1 The Contractor shall submit to the Engineer, on the first day of every month, a manpower schedule for the month, detailing the manpower scheduled for the month, skill-wise and area-wise.

8.13.2 The Contractor shall also submit to the Engineer on the first day of every month, a manpower report of the previous month detailing the number of persons scheduled to have been employed and actually employed, skill-wise and the areas of employment of such labour.



## 8.14 PROTECTION OF WORK

8.14.1 The Contractor shall have total responsibility for protecting his work till it is finally taken over by the Engineer. The Owner/Engineer will not entertain any claim for any damage or loss to the Contractor's works and Contractor shall be responsible for the complete restoration of the damaged works to its original condition complying with the specifications and drawings. Should any such damage to the Contractor's Works occur because of other party not under his supervision or control, the Contractor shall make its claim directly with the party concerned. If disagreement or conflict or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works, the same shall be resolved as per the provision of the Clause: 'Co-operation with other Contractor s'. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the work immediately and no cause thereof will be assigned pending resolution of such dispute.

## 8.15 ISSUING OF SECURITY GATE PASS

8.15.1 Issuing of Security gate pass is as per BSL rules and regulations. For foreign delegation of your company or experts other than your company wish to visit against this contract, the contractor will have to take prior permission from BPSCL & have to submit valid passport & VISA issued by the statutory authority before one week so that necessary

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security gate pass / passes can be made ready within time. The contractor needs to make their own arrangement for issuing of gate pass.

## 8.16 SECURITY

8.16.1 The Contractor shall have total responsibility for all equipment and works at Site till the time it is taken over by the Owner. The Contractor shall make suitable security arrangements, employing security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss. All materials of the Contractor shall enter & leave the project site only with the written permission of the Engineer in the prescribed manner.

## 8.17 EMPLOYMENT OF LABOR

8.17.1 The Contractor will be expected to employ on the work only his regular skilled employees with experience of that particular work. No female labour shall be employed after darkness. No person below the age of eighteen years shall be employed.

8.17.2 Contractor's employees shall wear identification badges while on work at site.

8.17.3 In case the Owner becomes liable to pay any wages or dues to the labour or to any Government agency under any of the provisions of the Minimum Wages Act, Workmen Compensation Act, Contract Labour Regulation Abolition Act or any other law due to act of omission of the Contractor, the Owner may make such payments and shall recover the same from the Contractor by the way of deducting from his bills.

8.17.4 To the extent possible unskilled labour shall be engaged from local area of site.

8.17.5 The Contractor shall at all times have due regard to the local religious, festivals & customs.

8.17.6 Contractor shall comply with all the provisions of labour, civil, State & Central laws, statutory rules, and regulations under the law. In case of his non-compliance with any provision, it will indemnify the Owner from and against all liabilities, damages, penalties, demand etc.

8.17.7 The contractor shall be responsible for the compliance of all statutory obligations under the Factory Act, Payment of wages act and also responsible for payment of employees contribution under E.P.F. and E.S.I act etc. in respect of his employees. The contractor along with the duly signed bills shall submit the list of workers engaged during the period, and permit the Owner/Engineer to deduct whatsoever amount becomes due under various acts from any of his bills. Contractor will have to pay wages and dues by cheque and give documentary evidence of payment of wages to his labours while producing the bills for payment against work done by him.

8.17.8 The contractor shall be registered with regional Provident Fund (PF) commissioner office and will have to quote PF code number. Responsibility of P.F. payment rests with the contractor. Non-payment of the PF due to delayed clearance of the firm's bills from Owner shall not be accepted.

8.17.9 The Contractor in the event of engaging 20 (twenty) or more workmen at site shall obtain independent license under contract labour (Regulation and Abolition act) from the concerned state labour authorities for which necessary certificate (Form 2) shall be issued by an Engineer.

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- 8.17.10 The contractor will be responsible for the payment of compensation to his labours in case of accident as may be admissible under the Workmen Compensation Act 1923. If he fails to pay the same, then the same shall be recovered from his bills due for payment to him by the Owner and will be paid to the injured person or his dependents as per the provision of the act. Contractor shall indemnify the Owner for all claims of injury caused to any of his employee or employee of his subcontractor.
- 8.17.11 The contractor will have to insure all his labours under Workmen Compensation Act, and submit the copy of the same to the Owner failing to which payment will not be released.
- 8.17.12 The contractor shall make his own arrangement for camping his labours. Owner will not give any assistance.
- 8.17.13 Compensation claimed for idle labour for any reason will not be entertained by the Owner.

### 8.18 CLEANLINESS

- 8.18.1 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 debris and scrap material shall be stacked and disposed in a place identified by the Engineer. Materials & 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 shall be provided to protect the floor from such damage.
- 8.18.2 The offices and the residential areas of the Contractor's employees and workmen shall be kept clean and neat to the entire satisfaction of the Engineer. Proper sanitary arrangements shall be provided by the Contractor in the work areas, office and residential areas of the Contractor.
- 8.18.3 In the event Contractor fails to keep his work area clean, the Engineer shall be free to engage alternate labour, after serving written notice to that effect to the Contractor, to clean up the Contractor's work area and realize the amount spent on this account from the Contractor.

### 8.19 SCRAP DISPOSAL

All the scrap to be disposed shall be segregated in to three categories a) Metallic scrap b) Non-metallic and biological scrap and c) Hazardous waste. The contractor shall make arrangement to collect the scraps at identified locations and transport it to the Owner's store as per instructions of the Owner's Site-in-charge for further disposal as per the rules. The re-usable scrap shall be separated from the collected scrap before disposal.

### 8.20 LINES AND GRADES

All the Works shall be performed to the lines, grades and elevations indicated on the drawings. The Contractor shall be responsible to locate and layout the Works. Basic horizontal and vertical control points will be established and marked by the Engineer at site at suitable points. These points shall be used as datum for the Works under the Contract. The Contractor shall inform the Engineer well in advance of the times and places at which he wishes to do work in the area allotted to it, so that suitable datum points may be established and checked by the Engineer to enable the Contractor to proceed with his

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works. Any works performed without being properly located may be removed and/or dismantled by the Engineer at the Contractor's expense.

### 8.21 CONTRACTOR'S AREA LIMITS

The Engineer will mark out the boundary limits of access roads, parking spaces, storage and construction areas for the Contractor and the Contractor shall not trespass these areas. The Contractor shall be responsible to ensure that none of his personnel move beyond the boundaries marked for his operations. In case of such a need for the Contractor's personnel to work beyond the boundaries, then the same shall be done only with the written permission of the Engineer.

### 8.22 CONTRACTOR'S CO-OPERATION WITH THE OWNER

In cases where the performance of the erection work by the Contractor affects the operation of the system facilities of the Owner, such erection work of the Contractor shall be scheduled to be performed only in the manner stipulated by the Engineer and the same shall be acceptable at all times to the Contractor. The Engineer may impose such restrictions on the facilities provided to the Contractor as electricity, water etc. in the interest of the Owner and the Contractor shall strictly adhere to such restrictions and cooperate with the Engineer.

### 8.23 CO-OPERATION WITH THE CONSULTANTS EMPLOYED BY THE OWNER

The Owner will employ project Implementation support consultant and Quality control consultant as per the Project Implementation Plan. The contractor shall fully cooperate in their work and in no way cause any restrictions to their work at Site.

### 8.24 TRIALS AND OPERATIONS

- 8.24.1 The trials and operations of the equipment furnished and erected by the Contractor shall be the responsibility of the Contractor. Such trials & operations shall be coordinated with the Owner and shall be performed with Owner's explicit clearance.
- 8.24.2 The Contractor shall provide all test instruments, calibrating devices etc. and the workmen required for the successful performance of the same.

### 8.25 MATERIALS HANDLING AND STORAGE

- 8.25.1 All the equipment furnished under the Contract and arriving at Site shall be promptly received, unloaded, transported and stored in the assigned storage spaces by the Contractor.
- 8.25.2 Contractor shall be responsible for examining all the shipment and notify the Engineer immediately of any damage, shortage, discrepancy, etc. for the purpose of Engineer's information only. The Contractor shall submit to the Engineer every week a report detailing all the receipt for the week. The Contractor shall take prompt actions for replenishments for any shortages or damage in transit, handling and/or in storage and erection of the equipment at the Site.
- 8.25.3 The Contractor shall maintain an accurate and exhaustive record detailing out the list of all equipment received by it and keep such record open for the inspection of the Engineer at any time.
- 8.25.4 All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings, etc. shall be used for unloading and/or handling of the equipment

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without the specific written permission of the Engineer. The equipment stored shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the store shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at Site.

- 8.25.5 All electrical panels, control gear, motor and heating shall be properly dried by such other devices before they are installed and energized. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and the same shall be periodically inspected. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.
- 8.25.6 All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and a record of such measured insulation values maintained by the Contractor. Such records shall be open for inspection by the Engineer.
- 8.25.7 The Contractor shall ensure that all the packing materials and protection devices used for the various equipment during transit and storage are removed before the equipment are installed.
- 8.25.8 The consumables and other supplies likely to deteriorate due to storage and same must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.
- 8.25.9 All the materials stored in the open or dusty location must be covered with suitable weatherproof and flame proof covering material wherever applicable.
- 8.25.10 If the materials belonging to the Contractor are stored in areas other than those earmarked for it, the Engineer will have the right to get it moved to the area earmarked for the Contractor at the Contractor's cost.
- 8.25.11 The Contractor shall be responsible for making suitable indoor storage facilities on the open land to be made available by the Owner to store all equipment, which require indoor storage. Normally, all the electrical equipment such as motors, control gear, generators, exciters and consumables like electrodes, lubricants, etc. shall be stored in the closed storage space. The Engineer in addition, may direct the Contractor to move certain other materials, which in his opinion will require indoor storage, to indoor storage areas, which the Contractor shall strictly comply with.
- 8.25.12 Dismantling work should be done with due diligence so as not to damage the equipment and other running units. The dismantled materials/ equipment should be handed over to the Owner at the designated storage place & site indicated by the Owner.

## 8.26 CONSTRUCTION MANAGEMENT

- 8.26.1 The field activities of the Contractors working at site will be coordinated by the Engineer and the Engineer's decision shall be final in resolving any disputes or conflicts between the Contractor and other Contractors and tradesmen of the Owner regarding scheduling and co-ordination of work. Such decision by the Engineer shall not be a cause for extra compensation or extension of time for the Contractor.

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- 8.26.2 The Engineer shall hold weekly meetings of all the Contractors working at Site, at a time and a place to be designated by the Engineer. The Contractor shall attend such meetings and take notes of discussions and decisions of the Engineer during the meeting and shall strictly adhere to those decisions in performing his works. In addition to the above weekly meetings, the engineer may call for other meetings either with individual Contractors or with selected number of Contractors and in such a case the Contractor, if called, will also attend such meetings.
- 8.26.3 The Contractor shall be responsible for performance of his works in accordance with the specified construction schedule. If at any time, the Contractor is falling behind the schedule, he shall take necessary action to make good such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such actions in writing to the Engineer, satisfying that, its action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.
- 8.26.4 The Engineer shall, however, not be responsible for provision of additional labour and/or materials or supply or any other services to the Contractor except for the co-ordination work between various Contractors as set out earlier.

## 8.27 FIELD OFFICE RECORDS

The Contractor shall maintain at his Site Office up to date copies of all drawings, specifications and other Contract Documents and any other supplementary data complete with all the latest revisions thereto. The Contractor shall also maintain drawings, specifications, supplementary data etc. effected at the field and on completion of his total assignment under the Contract shall incorporate all such changes on the drawings and other engineering data to indicate as installed conditions of the equipment furnished and erected under the Contract. Such as-built drawings and engineering data shall be submitted to the Engineer in required number of copies.

## 8.28 CONTRACTOR'S MATERIALS BROUGHT TO SITE

- 8.28.1 The Contractor shall bring to Site all equipment, components, parts, materials, including construction equipment, tools and tackles for the purpose of the Works under intimation to the Engineer. All such goods shall, from the time of their being brought vest in the Owner, but may be used for the purpose of the works only and shall not on any account be removed or taken away by the Contractor without the written permission of the Engineer. The Contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.
- 8.28.2 The Owner shall have a lien on such goods throughout the period of contract for any sum or sums which may at any time be due or owing to him by the Contractor, under, in respect of or by reasons of the contract. After giving a 15(fifteen) days notice in writing of his intention to do so, the Owner shall be at liberty to sell and dispose of any such goods, in such manner as he shall think fit including public auction or private treaty and to apply the proceeds in or towards the satisfaction of such sum or sums due as aforesaid.
- 8.28.3 After the completion of the works, the Contractor shall remove from the Site under the direction of the Engineer the materials such as construction equipment, erection tools and tackles, scaffolding etc, brought by him for the purpose of execution of the works covered under the contract. If the Contractor fails to remove such materials within 15 (fifteen) days of issue of a notice by the Engineer, then the Engineer shall have the

		
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liberty to dispose off such materials as detailed under Clause above and credit the proceeds there to the account of the Contractor.

## 8.29 PROTECTION OF PROPERTY AND CONTRACTOR'S LIABILITY

- 8.29.1 The Contractor shall be responsible for any damage resulting from his operations. He shall also be responsible for protection of all persons including members of public and employees of the Owner and the employees of other Contractors and sub contractors and all public and private property including structures, building, other plants and equipment and utilities either above or below the ground.
- 8.29.2 The Contractor will ensure provision of necessary safety equipment such as barriers, sign boards, warning lights and alarms etc. to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the Engineer and the Owner's of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his Works and shall make all necessary arrangements with such Owner's, related to removal and/or replacement or protection of such property and utilities.
- 8.29.3 The contractor shall be careful while execution of contract, not to cause any damage to the existing plant/ nearby running unit, Owner's property or other contractor's work. The contractor will be responsible to make good the losses and extra expenditure incurred by the Owner due to improper execution of contract. The amount equivalent to the damage caused to the existing plant /nearby running plant or auxiliary or generation loss if any or the other contractor's work shall be recovered from the contractor by the Owner from his bills. On repetitions of such occurrences contract shall also liable to be terminated.

## 8.30 PAINTING

All exposed metal parts of the equipment including piping, structures, railings etc. wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, grease, oil and other foreign materials by wire brushing, scrapping or sandblasting, and the same being inspected and approved by the Engineer for painting. Afterwards, the above parts shall be finished with two coats of alloyed resin machinery enamel paints. The quality of the finish paint shall be as per the Indian Standards or equivalent and to be of the color as approved by the Engineer.

## 8.31 UNFAVORABLE WORKING CONDITIONS

The Contractor shall confine all his field operations to those works which can be performed 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 the Contractor takes special precautions or measures in a proper and satisfactory manner in the performance of such works and with the concurrence of the Engineer. Such unfavorable construction conditions will in no way relieve the Contractor of his responsibility to perform the Works as per the Schedule.

## 8.32 WORK & SAFETY REGULATIONS

- 8.32.1 All provisions of the factory Act 1948, The Jharkhand Factory rules 1950, Indian Electricity Rules 1956 and other rules and regulations shall be strictly adheres to.

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- 8.32.2 The Contractor shall ensure safety of all the workmen, materials and equipment either belonging to him or to others working at Site. The contractor should provide welding screen, safety belts, appropriate hand gloves etc. depending on working condition and nature of job / work in hand. Good and approved quality appliances shall be arranged and replaced by new one as soon as worn out by the contractor at his cost.
- 8.32.3
- The contractor will have to keep two buckets of water while carrying welding works. One bucket is to be used for quenching fire, if occurred. Second bucket is to be used for dropping last bit of electrode so that red hot tip does not cause any fire or injury to other.
  - Cover / curtains should be provided in hazardous area so that hot spatters /molten metal do not cause fire. This should be ensured before starting of work particularly when carrying out cutting, welding work at higher elevation, on grills etc.
  - Single piece cable (without joint) should be used during welding work to avoid fire at cable joint. If joint is unavoidable, proper connector should be used.
  - Earthing should be done at spot nearest to welding work through earth grid only.
- 8.32.4 Proper housekeeping is a must during entire work period. Hazardous and inflammable material should be handled so as not to cause harm to the plant or people.
- 8.32.5 The Contractor will notify the Engineer of his intention to bring on to Site any equipment or any container, with liquid or gaseous fuel or other substance, which may create hazard. The Engineer shall have the right to prescribe the conditions under which such equipment or container may be handled and used during the performance of the Works and the Contractor shall strictly adhere to such instructions. The engineer shall have the right to inspect any construction plant and to forbid its use if, in his opinion, is unsafe. No claim due to such prohibition shall be entertained by the Owner.
- 8.32.6 Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act, 1934, Explosive Act, 1948, and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approvals of the Engineer. In case any approvals are necessary from the Chief Inspector of Explosives or any statutory authorities, the Contractor shall be responsible for obtaining the same.
- 8.32.7 The Contractor shall be responsible for provision of all safety notices and safety equipment required both by the relevant legislation and the Engineer, as he may deem necessary.
- 8.32.8 Contractor should maintain a history register of their lifting tools and tackles such as chain pulley blocks, slings, etc. and these are to be tested by competent person as defined in **Occupational Safety &Health** Association of **Jharkhand**. Copy of the test certificate should be submitted to the Engineer.
- 8.32.9 In case of injury to person, the incidence should be reported to the Owner without delay and all legal formalities should be completed at the earliest with the help of safety section.
- 8.32.10 If the engineer of the Owner finds that the contractor is not following the Safety rules and regulations including use of personnel protective equipment at site, he is authorized to

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stop the work of contractor immediately. In case of violation of rules after issue of warning letter contractor shall be liable for penalty as decided by Owner's authority.

- 8.32.11 For minor lapses of the workers and sub-contractors of the contractor, they shall be issued "Violation of Safety rules" on the spot or through Section-in-Charge. The staff should be instructed to accept it and comply with it. For repeated violation of rules, the order may be terminated and contractor may be declared debarred for further issue of work as per discretion of authorities.
- 8.32.12 The Contractor shall be responsible for the safe storage of his and his Sub-Contractor's radioactive sources, if any.
- 8.32.13 The Contractor shall follow/ adopt appropriate Occupational Health, Safety and Environmental (HSE) Management System and Occupational Health, Safety and Environmental (HSE) Clauses and Specification for Contractor's Work Contract.

### 8.33 ELECTRICAL SAFETY REGULATIONS

- 8.33.1 In no circumstances will the Contractor interfere with fuses and electrical equipment belonging to the Owner or other Contractors.
- 8.33.2 Each and every portable tool should be used with three pin plug and three wire system only. Proper Earthing should be checked both at supply end and at tool end by qualified electrician before commencement of work. Color coding of three wire system should be red for live terminal, grey/black for neutral and green for earth.
- 8.33.3 Three wire sockets and properly insulated electrical boards with fuse and with earth leakage circuit breaker shall be used by contractor. ON/OFF switch should be connected in live wire and not in neutral wire. This should be ensured by qualified electrician.
- 8.33.4 Hand lamp should be 24V only. Proper voltage conversion transformer should be used by the contractor. Protective grills and plastic cover shall be used for hand lamp.
- 8.33.5 Contractor should deploy competent workers for the particular job and should authorize his workers for carrying out electrical works such as welding, grinding and other works carried out by electrical appliances. Contractor should submit the list of his workers deployed for the job and list of workers who are authorized for carrying electrical works to the concerned section head for verification of competency of their workers before starting the work as per IE rules 1956.
- 8.33.6 Before the Contractor connects any electrical appliances to any plug or socket belonging to the other Contractor /Owner, it shall;
- Satisfy the Engineer that the appliance is in good working conditions.
  - Inform the Engineer of the maximum current rating, voltage and phases of the appliances.
  - Obtain permission of the Engineer detailing the sockets to which the appliances may be connected.
- 8.33.7 The Engineer will not grant permission to connect the electrical appliance until he is satisfied that: The appliance is in good condition and is fitted with a suitable plug. The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.

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- 8.33.8 No electric cable in use by the Contractor /Owner will be disturbed without prior permission. No weight of any description will be imposed on any such cable and no ladder or similar equipment will rest against or be attached to it.
- 8.33.9 No work shall be carried out on any live equipment. The equipment must be made safe by the Engineer and a permit to work issued before any work is carried out.
- 8.33.10 The Contractor shall employ the necessary number of qualified, full time electricians to maintain its electrical installation.

### 8.34 FOREIGN PERSONNEL

- 8.34.1 The Contractor shall submit to the Owner data on all personnel, if any, he proposes to bring into India for the performance of the Works under the Contract, at least 30 (thirty) days prior to their departure to India. Such data will include for each person, the name, his present address, his assignment and responsibility in connection with the Works, and a short resume of his qualification, experience, etc., in relation to the work to be performed by him.
- 8.34.2 Any person unsuitable and unacceptable by the Owner shall not be brought to India. Any person brought to India, if found unsuitable or unacceptable by the Owner, the Contractor shall within a reasonable time make alternate arrangement for providing a suitable replacement and repatriation of such unsuitable personnel.
- 8.34.3 No person brought to India for the purposes of the Works shall be repatriated without the consent of the Owner in writing based on a written request from the Contractor for such repatriation giving reasons for such an action to the Engineer. The Owner may give permission for such repatriation provided he is satisfied that the progress of work will not suffer due to such repatriation.
- 8.34.4 The Contractor and his expatriate personnel shall respect all Indian Acts, Laws, rules and regulations and shall not in any way interfere with Indian political, religious & social affairs and shall conform to any other rules and regulations of the Government of India, the Owner and the Engineer may establish from time to time, on them. The Contractor's expatriate personnel shall work and live in close co-operation and co-ordination with their co-workers and the community and shall not engage themselves in any other employment either part time or full time nor shall they take part in any local politics.
- 8.34.5 The Owner shall assist the Contractor, to the extent possible in obtaining necessary permits to travel to India and back, by issue of necessary certificates and other information needed by the Governmental agencies.

### 8.35 CODE REQUIREMENTS

The erection requirements and procedures to be followed during the installation of the equipment shall be in accordance with the relevant Indian Boiler Regulations, ASME codes and accepted engineering practice, the Engineer's Drawings and other applicable Indian recognized codes and laws and regulations of the Government of India.

### 8.36 FACILITY TO BE PROVIDED BY THE OWNER

The following facilities alone shall be provided by the Owner to the Contractor for execution of this work. Any other facility, whatsoever required to complete the works shall be arranged by the Contractor within the contract price.

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#### 8.36.1 Electricity

- a) The Contractor shall submit to the Engineer within 30 days from the date of issue of the Letter of Intent his electrical power requirement at site to allow the planning of temporary electrical distribution by the Engineer.
- b) The Contractor shall be provided with supply of electricity for construction purpose, which at one point in the project site. The Contractor shall make his own further distribution arrangements.
- c) While the Owner will make reasonable efforts to ensure continuous electric power supply, interruptions cannot be ruled out and no claim from the Contractor shall be entertained on this account such as idle labour, extension of time, etc. The Contractor shall adjust his working shift accordingly and deploy additional manpower, if necessary, so as to achieve the targets.
- d) Supply of electricity only for construction purposes shall be free. However the contractor shall be required to pay for electricity duty and taxes as levied by the Govt. at the prevailing rates. For all other purposes, i.e. office, supervisors quarters, etc., the electricity charges as per standard rates shall be payable by the Contractor.

#### 8.36.2 Water

- a) Free supply of water shall be made available for the construction purposes at an agreed single point in the site to be decided by the Engineer.
- b) Duty and taxes for water, if levied by the Govt., shall be payable by the contractor to the Owner at actual.
- c) Arrangement for water shall be made by the Contractor from water available at one point at site for the construction as well as for further distribution purposes.
- d) Cess and taxes for water, if levied by the Govt., shall be payable by the Contractor.

#### 8.36.3 Storage Space

- a) Reasonable open space shall be provided to the Contractor for the storage of materials during the period of storage and erection.
- b) The Contractor shall make proper arrangement for safe storage and protection of the equipment/materials during storage and erection till commissioning.
- c) The Contractor shall provide covered storage for the protection of sensitive equipment such as electrical meters, panels, motors etc. and for fragile materials as well.
- d) Communication: - The Owner will allow the Contractor to avail telephone & telex facilities available at site and will be charged at actual. Any additional communication facility if required shall be arranged by Contractor.

#### 8.36.4 Open Space for Site Office

The Contractor shall intimate the Owner within thirty (30) days from the date of Notification of Award about his exact requirement of space for its office, pre-assembly and fabrication area, labour and staff colony area, toilets etc. These requirements will be reviewed by the Engineer and the space will be allotted to the Contractor for construction of temporary structures for the above purposes for his own as well as his subcontractor's use. Contractor shall not use the site for any purpose other than for performing activities pertaining to the contract. No space for labour colony shall be provided.

Power Station Railway Siding and Shunting Locomotive

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- a) The Owner will allow the contractor to use the existing Power Station railway siding facilities for unloading of material and equipment dispatched against the contract as and when available and the contractor shall not be charged for the same. The locomotive for shunting of wagons from marshalling yard to the Power Station siding shall also be provided free of cost by the Owner. The use of locomotive by the contractor is purely subject to its availability. In the event the shunting locomotive is not available the contractor shall be required to make alternative arrangement at his risk and cost. The unloading of the material from wagons at the siding shall be the responsibility of the contractor. The modalities regarding the use of Owner's railway siding and shunting locomotive by the contractor for shunting of wagons shall be mutually discussed and decided between the contractor and the Engineer.
- b) The contractor shall not use the railway siding for any other purpose other than unloading of material pertaining to the contractor against this contract. The contractor shall note that Owner's other contractor for project and O&M works shall be operating at the Power Station siding. The contractor shall therefore take the prompt action to unload the material from the wagons and transport the same from siding immediately so as to avoid congestion at siding.

### 8.37 CLOSING OF SITE OFFICE

- a) After completing the works at site, the Contractor shall remove all temporary works constructed by them for establishing the office, storage, etc. and hand over back to the Owner the clear space as was allotted by the Owner while establishing the site establishment.
- b) The Contractor shall remove all erection equipment brought by him to site for execution of the contract as well as all left out material of supplies, consumables, etc. belonging to him with due permission of the Owner.
- c) All the balance supplies left over after completing the erection works & belonging to the Owner shall be deposited and stacked in the stores as instructed by the Owner.
- d) Unless all material are removed and clear space is handed over back to the Owner, the final bill payment as well as release of contract performance security shall not be considered by the Owner.
- e) On completion of the erection activities, the Contractor shall return the labour license to the Labour Commissioner and submit a proof of having cancelled the labour license to the Owner.

## 9.0 TESTS

### 9.1 GENERAL REQUIREMENT

- 9.1.1 The Contractor shall provide sufficient number of competent commissioning & start-up personnel, specially identified, for the period commencing with start-up, extending through initial & trial operations, all testing, to placing the plant to full commercial operation up to the issue of Operational Acceptance Certificates. During this period, the Contractor shall provide all the consumable materials, tools and tackles, temporary equipment, tapping points, calibration devices, special test instruments etc. necessary for start-up, commissioning, trial and initial operation and testing. The Owner will associate his operators in shifts, as required, for commissioning & testing under the supervision and work instructions of Contractor's commissioning & start-up personnel. All other labours, fitters etc. for starting, trial operation, initial operation, testing, repairs and adjustments shall be supplied by the Contractor.

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9.1.2 The Contractor shall start training the Owner's personnel sufficiently in advance of commissioning process and during the commissioning & start-up period to make them familiar with the Plant and intended operation techniques and to ensure safe and efficient operation & maintenance of the New Plant after the issue of Operational Acceptance Certificate.

9.1.3 The Contractor shall inform the Owner about its programme of conducting commissioning and operator training well in advance and this shall be agreed by the Owner at least three (3) months in advance of the commencement of the Commissioning Process of the Plant.

## 9.2 SHOP TEST

The Contractor shall indicate the Plant items to be tested at works in the presence of the Owner or his representative prior to dispatch to site along with the references to the relevant test standards. The individual shop tests for Plant Component shall be as per the approved International Codes and Standards as applicable for each item.

## 9.3 START-UP AND TRIAL RUN

9.3.1 The checkouts during the pre-commissioning period shall be programmed to follow the construction completion schedule. On completion of inspection, checking, cleaning and after the pre-commissioning tests are satisfactorily conducted, the complete equipment shall be placed on Trial Run during which period the complete equipment shall be operated integral with sub-systems and supporting equipment as a complete plant.

9.3.2 During this period all adjustments and repairs, as required, shall be made by the Contractor. The Plant may be shutdown, if necessary, to carry out such adjustments and repairs. On completion of satisfactory Trial Run, the Plant will be placed under initial operation.

9.3.3 When the equipment is operating satisfactorily, its characteristics shall be recorded on the start-up report sheets. Copies of typical start-up report shall be given to the Owner. Start-up reports for all equipment shall be completed before the start of the Initial Operation period.

9.3.4 Contractor will sign a protocol with Owner/Owner's representative that all systems commissioning has been checked and satisfactory and that unit is ready for initial operation.



9.3.5 A punch list will be prepared and jointly signed by Contractor and Owner/Owner's representative with the indication of the completion date for the same. The punch list items are the items pending for total completion but are not affecting the unit operation as identified for reliability test and thereafter.

## 9.4 INITIAL OPERATION

9.4.1 Each unit of the Plant shall be on Initial Operation during which period all necessary adjustments and final testing of all controls and protections shall be made which operating over the full load range enabling the plant to be made ready for Reliability Run and subsequently for Performance Guarantee Tests.

9.4.2 During this initial operation period, the operational requirements, as mentioned elsewhere in the specification, are to be demonstrated to the full satisfaction of the Owner.

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- 9.4.3 All the necessary data, adjustments, repairs etc. made during this operation are to be recorded properly by the Contractor and submitted to the Owner for its verification prior to Reliability Run and Performance Guarantee Tests.
- 9.4.4 This initial operation is aimed to establish the performance of the Unit steady-state operation at a required load level and to provide base-line operating data.

## 9.5 RELIABILITY RUN

- 9.5.1 The duration of Reliability Run of the complete Unit in the automatic position of control system under varying load shall be fourteen (14) days, out of which at least seventy-two (72) hours shall be in continuous operation on full load at design parameters and design input as per Clause 3.1.4 & 3.1.5 of Technical Specification.
- 9.5.2 The unit will be put on reliability run when the Owner is fully satisfied that the offered unit/ Plant has been fully proven with regard to its safety and operability. A 7 (seven) days' notice will be issued by the Contractor to the Owner about the completion of the Plant /Unit being ready for the Reliability Run. A joint protocol will be signed before the commencement of the Reliability Run by the Owner, the Contractor and any appointed /authorized agency of the Owner. This protocol will confirm the acceptance of the participating parties that all the Plant/ unit systems have been completed and are put in auto operation with all necessary adjustments and final testing of all controls and protections are made for operating over the full load range and the Plant/ Unit is ready for the Reliability run. A Punch List, that is a list of items not completed, the lack of which or failure of completion of which (considered individually or in aggregate) will not affect the performance and safety of the Plant /Unit or ability of the Owner to safely and efficiently operate and maintain, along with a Schedule for completion of the same will be submitted by the Contractor and agreed to by the Owner and jointly signed as a part of the protocol for commencing the Reliability Run. By way of example, Punch List may include landscaping, final grading, clean up, final painting etc.
- 9.5.3 At any time prior to the Handing Over date, the Owner or the appointed agency by the Owner has the right to add to Punch List Items if the same are found to be deficient. All the items which Owner believe to be deficient after the Plant Operational Acceptance Date but with the Warranty Period, as applicable, shall be submitted to the Contractor as warranty work.
- 9.5.4 By approving the Punch List or acknowledging the Plant readiness for Reliability Run by the Owner or its appointed /authorized agency shall not forfeit the irrespective right to add to Punch List (prior to Operational Acceptance Date) or to make claim for warranty work for those items which prove to be deficient after such acknowledgement or which were overlooked by the Owner or appointed/authorized agency prior to such approval or acknowledgement.
- 9.5.5 A joint protocol to be signed before the Reliability Run.
- 9.5.6 Operation of the unit of the Plant shall be continuous without any failure or interruption of any kind during this fourteen (14) days period. It will be required to operate the unit/ Plant under various operating modes along with range of fuels as specified during this period. It is the Contractor's responsibility to make the plant capable to run continuously for the 14 days period.

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- 9.5.7 Should any major failure or interruption occur in any portion of the plant due to or arising from faulty design, materials, workmanship or omissions or incorrect erection, sufficient to prevent safe and full commercial use of the plant, the reliability run shall be considered void and the reliability test period of 14 days shall recommence after the Contractor has remedied the cause of defect. In case any alteration or redesign is required, it shall be discussed and approved by the Owner before implementation. All the systems will run in auto mode and no major maintenance will be allowed.
- 9.5.8 The Contractor should specify the quantity for the following four (5) inputs from the Owner required for the commissioning and stabilization of the unit after R&M.
- Coal in MT
  - Furnace oil in kilo liters
  - Blast furnace and coke oven gas in cu. m / hr
  - Raw Water in cu. m
  - Startup power in kWh and peak in kVA.

## 9.6 PERFORMANCE GUARANTEE TESTS

- 9.6.1 Acceptance Tests consist of Reliability Run and Performance Guarantee Test. The unit is taken over based on successful completion of Reliability Run (part of Acceptance Test).
- 9.6.2 All costs associated with the tests including cost associated with the supply, calibration, installation and removal of the test instrumentation shall be included in the contract price.
- 9.6.3 After completion of satisfactory Reliability Run, the Contractor shall prepare the unit for Performance Guarantee Test. It shall be the responsibility of the contractor to make the plant ready for performance guarantee tests. For carrying out the performance test(s) the contractor can seek the assistance of Owner's operating personnel.
- 9.6.4 The PG test shall be carried out within 90 days of Reliability test (stabilized operation) when the unit is being operated by the Owner or as per the time frame specified for a particular equipment/ plant/ system in the Technical specifications. Within this period no de-rating of the equipment performance will be permitted. In case of delay in carrying out the Performance/Acceptance Test for reasons not attributable to the Owner, the Contractor shall be required to prove the specified performance guarantee without any de-rating/ageing factor.
- 9.6.5 These tests shall be carried out by the Contractor to the requirements of the Owner, as per the procedure / test codes specified in respective detailed equipment specifications. The Owner will provide the requisite load and fuel for the test.
- 9.6.6 The Performance & Guarantee test procedures shall be submitted for equipments/ system & subsystem under Contractor's scope for all Performance Guarantee /warranty / requirement parameters /conditions, as per latest International codes / standard including correction curves, meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees.
- 9.6.7 The Contractor shall submit for Owner's approval the detailed Performance Test procedure containing the following:
- Objective of the test.

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- Various guaranteed parameters & tests as per contract.
- Method of conductance of test and test code.
- Duration of test, frequency of readings & number of test runs.
- Method of calculation.
- Correction calculations & curves.
- Instrument list consisting of range, accuracy, least count, and location of instruments.
- Scheme showing measurement points.
- Sample calculation.
- Acceptance criteria.
- Any other information required for conducting the test.

9.6.8 The Performance Tests will be conducted in accordance with internationally recognized codes such as ASME PTC. This should be highlighted by the Contractor in his offer. The Contractor shall submit the test procedure for Owner's approval within twelve (12) months from the date of "Letter of Award" of the contract or any time frame mutually agreed between Owner and Contractor. This procedure shall indicate the tentative date & program, the arrangement & form of the tests, log sheets, duration, control periods, readings to be taken, number of observers required etc. and any other requirements in accordance with applied test code. The test shall be carried out by the test grade instruments as stipulated in the applicable test code. These instruments shall be calibrated by the Contractor in a recognized laboratory not exceeding three (3) months prior to the date of test and shall furnish the certified calibration curves. Batch calibration will not be acceptable. The class of accuracy of the instruments shall be as specified in the code. All measuring devices including related display instruments/data logger need to be provided with valid calibration certificates from the approved independent authority. The tests will be conducted at the specified load points, and as near the specified cycle conditions as practicable. Proper corrections in calculations to take into account the condition which do not correspond to the specified conditions will be applied in the test report as per stipulations to be decided before finalization of the procedures. All the applicable correction curves and standard calculations based on the design coal and guaranteed conditions are to be submitted for approval of the Performance Test Procedures. In case of any condition mentioned here contradicts to the provision of respective General Conditions of contract in commercial document the provisions of GC shall prevail.

9.6.9 All special test grade instruments including Power meter with 0.02 % accuracy with printer, equipment, tools and tackle, required for the successful completion of the Performance Tests shall be brought for the purpose of the test, free of cost by the Contractor.

9.6.10 Should the plant or any portion thereof fail under these tests to give the performance required, then any further tests which may be considered necessary by the Owner shall be considered in a similar manner.

9.6.11 In case during performance guarantee test(s) it is found that the equipment /system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications and / or replacements to make the equipment / system comply with the guaranteed requirements at no extra cost to the Owner and re-conduct the performance guarantee test(s) with Owner's consent. In case the specified performance guarantee(s) are still not met but are achieved within the acceptable Shortfall Limit, the Owner shall either reject the newly installed equipment / system / plant and recover from the Contractor the payments already made OR Accept the equipment/system/plant after levying Liquidated

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Damages for Performance Guarantees as per the provisions of GC and SC and In case the specified performance requirements are still not met but are achieved within the acceptable Shortfall Limit, the Owner shall either Reject the newly installed equipment / system / plant and recover from the Contractor the payments already made OR Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the Owner. Such damages shall, however be limited to the cost of replacement of the equipment(s)/system(s), replacement of which shall remove the deficiency so as to achieve the guaranteed performance.

**9.6.12 Test Reports**

After the conductance of Performance test, the Contractor shall submit the test evaluation report of Performance test results to Owner within one month from the date of completion of Performance test. Preliminary test reports shall be submitted to the Owner after completing each test run. Four (4) hard copies and two (2) soft copies on CD-ROM of each test report of final conducted test on each equipment/plant/system backed up with jointly signed data sheets recorded during the test period shall be submitted to Owner for approval.

**9.6.13** The guaranteed performance figures of the equipment and operating margins shall be proved by the Contractor during these tests. Should the Owner's assessment of these tests show any deterioration from the guaranteed values, the Contractor shall modify the equipment as required at no extra cost to enable it to meet the guarantees. In such case Performance/Acceptance Tests shall be repeated after the equipment is ready for retest. The whole cost of the repeated tests including the costs of fuel and consumables necessary to carry out the tests, less any revenue received by the Owner from electricity sales, to prove that the equipment meets the guarantees, shall be borne by the Contractor. However, if the Contractor is not able to demonstrate the guarantee even after the modifications within ninety (90) days or a reasonable period allowed by the Owner, the Owner will have the right to reject the equipment/system/plant and recover the payment already made or accept the equipment/system/plant after levying liquidated damages.

**9.6.14** Whenever it is not practicable to conduct the performance guarantee test at site, and an accurate test to prove the guaranteed parameters have already been conducted in the shop test, such a test may not be repeated, if so agreed by the Owner.

**9.6.15** The tests to be carried out for performance guarantee parameters stipulated in Performance requirements stipulated in the technical specifications.

**9.6.16 Extended Performance Tests**

- a) An extended performance period will be required to demonstrate the compliance with the required availability for the duration of the Defects Liability Period. This period will commence following takeover of the plant.
- b) The Contractor shall specify the information required, in addition to that available on the SCADA system, to demonstrate compliance with the availability requirement.
- c) The extended period to prove availability shall be one (1) year from the taking over of the plant by the Owner. During this period the responsibility of supervision of any major repair, maintenance or overhaul will be that of the Contractor while the operation and normal maintenance is carried out by the Owner.

**9.6.17 Performance Guarantees and Performance requirements.**

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In the performance Guarantee test, Contractor has to prove the performance guarantee parameters within the shortfall limits as specified in the Commercial volumes.

Liquidated damages as specified in the Commercial Documents are applicable to the shortfall in performance within the acceptable limits.

The test efficiency shall be based on the overall performance of the electrostatic precipitator over a mutually agreed period of operation under the conditions given in this specification and allowing the normal operation of the unit including rapping and normal soot blowing and / or when fuel oil is being fired in the igniters and / or warm up guns.

#### Performance Requirements

The Performance requirements stipulated in the respective sections or in the equipment specifications which are not covered in the functional guarantees but are required to be demonstrated during operation or tests, if they are not fulfilled as required, the Owner have right to accept or reject the newly installed equipment / system /plant, as per the provision of relevant clause. The acceptance or rejection of the equipment/ plant shall be covered under provisions of Volume-I GC clause of "Defect Liability". The procedure of demonstration of the performance requirement is the same as the Performance guarantee test and all the subsequent conditions for test/repeat test will be applicable to these tests. The extended period to prove availability shall be one (1) year from the taking over of the plant by the Owner. During this period, the responsibility of supervision of any major repair, maintenance or overhaul will be that of the Contractor while the operation and normal maintenance is carried out by the Owner.

The Contractor shall specify the information required, in addition to that available on the SCADA system, to demonstrate compliance with the availability requirement.

An extended performance period will be required to demonstrate the compliance with the required availability for the duration of the Defects Liability Period. This period will commence following takeover of the plant.

The tests already been conducted in the shop may not be repeated, if so agreed by the Owner.

## 10.0 PROJECT MANAGEMENT, PROGRESS REPORT AND PHOTOGRAPHS

The Contractor shall submit, within fifteen (15) days from the date of Contract, an extensive L1 Network (to be prepared by using Primavera software package or Microsoft Project) covering various key phases of the work such as design, procurement, manufacturing, shipment and field erection activities in line with the agreed work schedule. This network shall also indicate the interface facilities to be provided by the Owner and the dates by which such facilities are needed. The Contractor shall discuss the network so submitted with the Owner and the agreed network, which may be in the form as submitted or in revised form in line with the outcome of discussions shall form part of the Contract Documents.

The Contractor shall submit the detailed L2 and L3 Networks (to be prepared by using Primavera software package or Microsoft Project) within the time schedule as directed by the Owner. In such networks, the Contractor shall divide the work under the Contract into various small activities, assign the relationship between various activities, fix the start and finish dates of all the activities, highlight the activities which are on the critical paths, indicate the total and free floats available between the various activities etc. The

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Contractor shall submit such detailed networks in soft form (in CD) to enable Owner to incorporate the same in Master Network of complete project.

Fortnightly progress reports shall be submitted by the Contractor. The progress report shall be submitted in such a form as may be required by the Owner. These shall detail the status of design, erection, procurement of raw materials, approval of Contractor's drawings, manufacture of the equipment, procurement of sub-contractors items and statement showing position of payment. The report shall also include planned milestone dates and delays if any and reasons for delay and remedial measures for the same.

The Contractor shall furnish three (3) prints each of progress photographs of the work done in his shop. Photographs shall be approximately 8x10 inches in size, including a margin on one of the 10-inch sides for binding. Adequate number of Photographs shall be submitted indicating various stages of manufacture. Each photograph shall contain the date, the name of the Contractor and the title of the view taken.

Contractor's Representative & Construction Manager shall be appointed in accordance with the provisions contained in the General Conditions forming part of the Contract Agreement.