TECHNICAL SPECIFICATION FOR PRESSURE & STORAGE VESSEL

1.00.00 GENERAL

The following principal pressure and atmospheric vessels for the system has been covered in this part of specification.

1. Condensate polisher service vessel/Mixed bed polisher.
2. Resin Separation and Cation Regeneration vessel.
3. Anion regeneration vessel.
4. Mixed resin storage Vessel.
5. Alkali diluent Heating cum Storage Vessel.(hot water tank)
6. Activated carbon filter
7. Alkali Preparation Tank
8. Alkali Day Tank
9. Resin Injection/make-up Hopper
10. Acid Measuring Tank.
11. DM water storage tank.

1.01.00 Of these, the items specified from sno 1 to 6 shall be designed as pressure vessels and the rest shall be atmospheric vessels.

1.01.01 All other vessels, not specifically listed here, but required for the Bidder's system shall also meet the general requirements of this specification.

1.01.02 Process requirements of these vessels shall be governed by the requirements of the Condensate Polishing System, which will determine their design conditions. Following sections only indicate some of the minimum requirements which must be met, and the actual design of these vessels shall be better than these, if that is required from process considerations.

2.00.00 GENERAL DESIGN FEATURES

2.01.00 **Design**

2.01.01 Design of all pressure vessels shall conform to ASME Section VIII or acceptable equivalent international standard. Design pressure shall be the maximum expected pressure to which the vessels may be subjected to plus 10% additional margin. Maximum expected pressure for vessels placed in the discharge line of pumps shall be based on the shut-off head of the pumps plus static head at pumps suction if any. Design pressure of condensate service vessels is indicated elsewhere in this specification. For all other pressure vessels, design pressure shall be at least 10 Kg/cm² (g).

2.01.02 Design of all vertical cylindrical atmospheric storage tanks containing water, acid, alkali and other chemicals shall conform to IS: 803.

2.01.03 Design of all horizontal cylindrical atmospheric storage tank containing water, acid, alkali and other chemicals shall conform to BS EN12285-2:2005.

2.01.04 Design temperature of all pressure vessels and storage tanks shall be 10 deg. C higher than the maximum temperature that any part of the vessel/tank is likely to attain during operation.

2.01.05 In case, tank is subjected to vacuum; the same shall be taken care in designing the tank.

2.02.00 All vessels / tanks without inside rubber lining shall have a corrosion allowance of minimum 2 mm and

mill allowance (minimum 0.3 mm) for shell and dished ends. Thinning allowance of 2 mm (minimum) shall be considered for dished end. Vessel and atmospheric tank ends shall be of dished design and constructed by forging, pressing or spinning process. Conical or flat ends shall not be accepted. All dished ends shall be stress relieved.

2.03.00 All the atmospheric tanks shall have sufficient free board above the “Level High”/”Normal Level” as the case may be. The overflow level shall be kept at least 20 cm or 10% of vessel height above the “Level High”/”Normal Level” for all the tanks. Further, a minimum 100 mm free board shall be provided above the top of overflow level to the top of the tank. Wall thickness of atmospheric tanks shall not be less than 6 mm.

2.04.00 Vessels coming under preview of IBR shall be designed accordingly.

2.05.00 Interior surfaces of all tanks shall be clear of stiffeners and other structural supports. Tanks shall be reinforced and stiffened externally as required.

2.06.00 All welds on inner tank surface shall be free of voids, gaps craters, pits, high spots, sharp edges, abrupt ridges and valleys or undercut edges. High spots, irregularities and sharp edges shall be removed by grinding. Inside weld seams shall be ground flush and smooth applicable for corrosion resistant coating or lining.

2.07.00 All internal baffles, wear plates, pipes etc. shall be continuously welded on both sides at all contact points with full fillet welds which shall be free of voids, gaps, craters, high spots, sharp edges, and undercutting. Sharp edges shall be ground to a 3 mm minimum radius.

2.08.00 Weld splatter shall be removed.

2.09.00 All welding shall be performed by ASME qualified welders under Section-IX of ASME Boiler and Pressure Vessel code and welding electrodes shall be as per relevant Codes/Standards viz. AISC Section 1.17 etc.

2.10.00 The plates for cylindrical tanks shall be accurately formed in bending rolls to the diameters called for, and the completed shells be concentric and plump. Plates shall be cold-rolled by plate bending machine in a number of passes to true curvature and joined by welding.

2.11.00 Vessels seam shall be so positioned that they do not pass through vessel connections.

3.00.00 MATERIAL OF CONSTRUCTION

3.01.00 Please refer DATA SHEET-A.

4.00.00 APPURTENANCES

4.01.00 **Manholes**

4.01.01 All the pressure vessels and horizontal type storage tanks shall be provided with manhole of 500 mm diameter minimum size, preferably at the top head, complete with cover plate, lifting handle, davit cap, nuts, bolts, gaskets etc. to ensure leak tightness at the test pressure.

4.01.02 The vertical type storage tanks shall be provided with a manhole of 500 mm dia on the top cover, if the diameter of the tank is 1200 mm or more. For the DM water storage tanks, manholes shall be provided as per IS:803.

4.01.03 All the vessels and tanks shall be normally provided with a six inch gasketed handhole located near the bottom of the straight side.

4.01.04 The required lining/coating for the inside surface of the manhole/handhole, nozzle and cover plate of the manhole/handhole shall be same as that of the respective vessel/tank.

4.01.05 **Sight Glasses**

All the vessels mentioned shall be provided with pad type sight glasses on their vertical sides. Locations of these sight glasses shall be as follows:

4.01.06 One with the centre line at the normal level of the bed top, and one near the bottom of the straight side, for each of these vessels.

4.01.07 In addition, item no. 1.00.00 shall be provided with sight glasses, with their center lines at each of the normal separated resin interfaces.

4.02.00 **Lifting Lungs**

All vessels of diameter 1200mm or greater shall be provided with a minimum of 4 lifting lugs. Smaller vessels shall be provided with at least 2 lifting lugs.

4.03.00 **Vessels Supports**

Adequate supporting arrangements like straps, saddles, skirt rings, or legs of steel shall be provided to transfer all loads to the respective skid structures.

4.04.00 **Vessel Internals**

The internals for pressure Vessels shall be designed for a low pressure drop to promote uniform distribution and flow through the vessels and to withstand the full design pressure of the vessel in both directions.

Specification requirements for vessel internals are as follows:

4.05.00 **Inlet water and Regenerant Distributors**

Hub and laterals with diffuser splash plates or header and perforated laterals. Material of construction shall be type 316 stainless steel, except for acid service which shall be of Hastelloy B.

4.06.00 **Underdrains**

Same as above with screened laterals with internal perforated pipes, and rubber-lined false bottom. For resin separation/regeneration/mixed resin vessels, it may have fully screened bottom (NEVA – clog type with para Septanurse screen, fully supported by subway grid, or equal).

4.07.00 For lined vessels, they shall also be lined in the same manner as the internal surfaces of these vessels. For the caustic diluent heating/storage tank, they shall be of type 304 stainless steel construction.

4.08.00 **Internal Fasteners**

All internal fasteners shall be of type 316 stainless steel and heavy duty locknuts shall be used throughout.

4.09.00 **Piping Connections**

All lined vessel connections and connections in unlined vessels 25 NB and larger shall be to minimum ANSI 300 lb class. Flat face flanges shall be used throughout. Nozzle material shall be ASTMA-106. Grade B. schedule 80 pipe. All flanged connections shall be supplied complete with matching counter flanges, nuts, bolts and full-face gaskets.

4.10.00 All vessel connections in unlined tanks smaller than 25 NB shall be screwed to ANSI 2.1 for schedule 80 pipe.

4.11.00 **Resin Traps**

Outlets of each of the condensate polisher service vessel and the waste effluent header of the common external regeneration facility, shall be provided with a resin trap. These resin traps shall be a minimum, conform to the following:

4.11.01 The resin trap shells shall be of steel construction and lined internally with saran or Polypropylene. The internals for all traps shall be johnson well screen type, of 316 stainless steel in both directions, resin traps located in processes effluent lines shall have a screen opening that does not exceed 120 percent of the associated process vessel under drain screen opening. Resin traps located in waste effluent headers shall have a screen opening of approximately 60 mesh.

4.11.02 Each resin trap shall be fully piped and valved for inplace manual back flushing.

5.00.00 SPECIFIC DETAILS

5.01.00 **Alkali Diluent Heating – Storage Tank (Hot water tank)**

This vessel shall be sized to hold a minimum of 5000 liters of 80 deg C demineralised water required for the regeneration of condensate polisher. In sizing this vessel, preheating of the anion resins shall not be considered as a requirement. The cold water feed line shall enter the tank through or near the top head and extend downward to within 15 cm of the tank bottom. Recovery time shall not exceed 4 to 5 hours.

All tank internals, including the inlet water tail pipe, shall be fabricated of type 304 stainless steel.

5.02.00 **Atmospheric Tanks**

Wall thickness of these tanks shall not be less than 6mm.

5.03.00 **Resin Injection Hopper**

The supplier shall provide a hopper type tank for resin make-up, using water slurry, to the condensate polishing systems. This make-up system will constitute a portion of the condensate polishing external regeneration system. The resin hopper shall have a conical bottom and a flat top. The top shall have a piano type hinged port, having a lifting handle, of sufficient size for easy resin loading. The resin shall discharge through a bottom connection to a water ejector for transport. Water shall be added to the hopper to assist in the resin transfer. The ejector discharge shall be to the resin separation-cation regeneration vessel. Demineralized water shall be used throughout for the resin transfer. Piping of the resin make-up system shall be the responsibility of the Bidder as a part of the external resin regeneration system.

a) **Capacity**

The resin make-up hopper tank shall be sized to handle up to 150 liters of as received new resin per single injection or maximum attrition loss whichever is higher.

b) **Material**

The resin make-up hopper tank shall be fabricated of mild carbon steel having a minimum thickness of 6mm and rubber lined.

5.04.00 **Chemical preparation and day tanks**

These shall be vertical cylindrical tanks. They shall be of carbon steel fabrication, lined and provided with full height level gauges right up to the overflow levels.

The alkali preparation tank shall be provided with a dissolving basket of type 316 stainless steel constructions, and a motorized slow speed stirrer mounted eccentrically to the tank by a bracket fixed to the side wall. The stirrer shall have impellers of type 316 stainless steel.
The alkali day tank shall be provided with an airtight cover complete with a breather arrangement, to prevent absorption of carbon dioxide from the atmosphere by the alkali solution contained in it. The overflow connection shall also be provided with a suitable seal for this purpose.

The tanks for ammonia solution (if applicable) shall also be provided with similar arrangements to

prevent escape of ammonia vapor to outside.

5.05.00 **LINING**

All internal lining of vessels provided under this specification shall be of natural rubber, meeting the following minimum requirements.

5.05.01 **Hardness**

Lining used may be soft rubber having a shore durometer reading or 4070 on the D scale, or semi-hard rubber having a durometer reading of 4570 on the D scale. Variations in hardness of the rubber lining between the different areas of a specific tank shall be within +/-5 durometer reading.

5.05.02 **Chemical Resistance**

The lining material shall be suitable for prolonged service in the chemical environment described below:

a) Hydrochloric acid, 2 to 8% concentration, at temperature from 10 deg C to 50 deg C.

b) Sodium hydroxide, 1 to 4% concentration, at temperature from 30 deg C to 50 deg C.

c) 100 to 500 mg /l of sulphuric and hydrochloric acid combined. Ratio of concentration of these two acid 1 : 5 to 5 : 1 and temperatures from 10 deg C to 40 deg C.

d) 1 to 10mg/l of sodium hydroxide at temperature from 10 deg C to 40 deg C.

The linings will be subjected to the condition (a) or (b) for intermittent periods of approximately one hour out of eight hours, and to conditions (c) or (d) remainder of the time.

5.05.03 **Thickness**

The lining shall be applied in three layers, resulting in a total thickness of not less than 4.5 mm anywhere on the internal surfaces of the vessels. The lining shall extend over the full face of all flanged connections and shall have a minimum thickness of 3 mm in all such external areas.

5.05.04 **Surface Preparation**

Prior to rubber lining all surfaces must be prepared in he following manner.

a) Degrease surface prior to blasting.

b) The surface is to be blasted with steel grit or sharp silica sand to a white and bright metal surface.

c) All traces if grit and dust should be removed with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface.

d) Immediately after blasting and removal of grit, the first coat of primer or cement shall be applied and allowed to dry.

5.05.05 **Protection**

After the lining is completed the vessels shall not be subjected to any prolonged exposure to direct sunlight in course of it's transportation erection, etc. They shall not also be stored in direct sunlight. No further welding or burning shall be carried out on the vessel, after application of the lining.

All lining projecting outside of the vessel, shall be protected adequately from mechanical damages during shipment, handling, storage etc.

Suitable warning, indicating the special care that must be taken with respect to these lined vessels, shall be stenciled on their outside surfaces with the letter at least 12mm high.

Example:

"Warning – Tank is lined"

"Do not weld or Burn"

"Do not Store in Direct Sunlight" etc.

6.00.00 CODES AND STANDARDS

The design, manufacture, shop testing, site fabrication and erection, testing and commissioning of the pressure and storage vessels shall conform to the latest revisions of the following standards, in addition to other standards mentioned elsewhere in the tender document subject to any modification and requirement, as specified here in after.

a)	IS: 803	-	Code of practice for design, fabrication and erection of Vertical Mild Steel cylindrical welded oil storage tanks.
b)	IS: 816	-	Code of practice for use of metal arc welding for general construction in mild steel.
c)	IS: 817	-	Code of practice for training and testing of metal arc welders.
d)	IS: 822	-	Code of procedure for inspection of welds.
e)	IS:1363	-	Black hexagonal bolts, nuts and locknuts (dia 6 to 39 mm) and black hexagon screws (dia to 24 mm).
f)	IS:1367	-	Technical supply conditions for threaded fasteners.
g)	IS:2062	-	Specification for weld able structural steel.
h)	IS:2002	-	Steel plates for pressure vessels for intermediate and High temperature service including boilers.
i)	IS:2825	-	Code of unfired pressure vessels.
j)	IS:3133	-	Manhole and inspection opening for chemical equipment.
k)	IS:4049	-	Specification for formed ends for tanks and pressure vessels.
l)	IS:4682	-	Code of practice for lining of vessels and equipment for chemical processes Rubber Lining.
m)	BS:2594	-	Specification for carbon steel welded horizontal cylindrical storage tanks.
n)	ASME	-	Boiler and pressure vessel Section VIII code.
o)	ASTM	-	American Society for Testing and Materials.

7.00.00 FABRICATION

7.01.00 The vessel ends for storage tanks of vertical type shall have dished ends at top & bottom. However, the ends of horizontal storage tanks, and all the pressure vessels shall be dished design of Tori-spherical type designed.

7.02.00 The plates to be used for fabrication shall preferably have a minimum width of 1500 mm.

7.03.00 All the joints (circumferential / longitudinal) shall be continuous butt welded, inside and outside. Connection shall be flush with inner surface of tanks and welded continuously on both sides of shell. Sharp inside edges shall be rounded to a minimum 3 mm radius.

7.04.00 Welding sequence shall be adopted in such a way so as to minimize the distortion due to welding shrinkage. Bidder shall indicate in his drawing the sequence of welding proposed by him which should meet prior approval of the BHEL and customer. Welding shall not be carried out when the surface of the parts to be welded are wet from any cause and during periods of rain and high winds unless the welder and work are properly shielded.

7.05.00 All pressure vessels and storage tanks except Demineralised water (D.M.) shall be fabricated complete and tested at manufacturer's works to ensure better workmanship.

7.06.00 **Tank Connections**

7.06.01 Bidder shall furnish all pipe material required for tank connection for the process requirement. In addition to these, additional connections, if required by the BHEL and customer for the inter-connection of their piping, instrumentation etc. shall also be provided. Such additional requirement will be intimated to the successful Bidder later and Bidder shall provide these fittings to match with the BHEL and customer's items. Adequate pipe support attachments in the external surface of the tank/vessel shall be provided for Owners pipes for all the vessels/tanks. All lined vessels connections shall be conform to minimum ANSI 300 lb class. Nozzle material shall be ASTM-106 Grade B, Schedule 80.

7.06.02 All flanged connections should be supplied complete with matching counter flanges, nuts bolts and gasket materials. The flange design, (thickness and drilling etc.) shall match with the interconnected piping flanges.

7.06.03 Bolts and nuts to be used externally to the vessels shall be of hexagonal head conforming to IS:1367. However, internal fasteners if any, shall be of IS:316 /SS-304 or Hastalloy-B as per the duty conditions.

7.06.04 Gaskets shall be of full face type.

7.06.05 Sight glasses shall be provided for the tanks/vessels as specified in the standard specification. The material for sight glass shall be high quality transparent PLEXIGLASS of sufficient thickness to withstand the test pressure. The sight glass shall be provided with suitable gaskets and bolts to ensure leak tightness at the test pressure.

7.07.00 **Vessels Supporting Lifting Lugs**

7.07.01 Adequate supporting arrangements like straps, saddles, skirt boards, pillars etc. shall be provided to transfer all loads to civil foundation. All foundation bolts, inserts etc. shall also be provided.

7.07.02 All vessels of internal, diameter of 1200 mm or greater shall be provided with minimum four (4) lifting lugs for safe and effective handling during erection. Smaller vessels shall be provided with at least two (2) lifting lugs.

7.07.03 Material of construction for these vessel supports, saddles, lugs shall conform to IS:2062 of tested quality.

7.08.00 **Special Accessories Storage Tanks**

7.08.01 Vessel internals wherever required shall be provided as detailed out elsewhere in the specification.

7.08.02 All the pressure vessels and tanks shall be provided with drain connections along with drain valves of suitable size. Further all the atmospheric storage tanks shall be provided with over flow connection designed for the filling rate of the respective tank.

7.08.03 All the pressure and tanks shall be provided with the vent connections. The design shall be as to offer adequate area for venting. Venting area shall be such that over pressure/vacuum is not created in the

tank during maximum filling/drain-off rate. The maximum draw off rate for the DM storage tanks shall be intimated later to the successful bidder.

7.08.04 Various instrumentation and the fittings required for the same shall be supplied as elaborated in data sheets.

7.08.05 The vent and overflow lines of alkali preparation /measuring / day tanks and vent line of DM storage tanks shall be provided with Carbon dioxide absorber of proven design to prevent contamination from atmospheric air. Carbon dioxide absorber shall preferably be located at ground level. The vent and overflow lines of Acid measuring tanks shall be provided with fume absorber using suitable packing material, such as pall rings/raschig rings.

SECTION-C2-B
GENERAL REQUIREMENT

SECTION-C2-B
GENERAL TECHNICAL REQUIREMENT

VOLUME : IIA

SECTION-IV

GENERAL TECHNICAL REQUIREMENTS

1.00.00 CODES AND STANDARDS

1.01.00 Except where otherwise specified, the Plant shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as listed in the annexure to this Section and mentioned in detailed specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary; to enable the Owner to identify all of the Plant in the same detail as would be possible had there been a Standard Specification.

1.02.00 Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.

1.03.00 The plant will be designed in compliance with applicable National and International Codes and Standards such as ASME, ASTM, DIN, BS, IEC, IEEE, IS, etc. Wherever specified or required the Plant shall conform to various statutory regulations such as Indian Boiler Regulations, Indian Explosives Act, Indian Factories Act, Indian Electricity Act, Environmental Regulations, etc. Wherever required, approval for the plant supplied under the specification from statutory authorities shall be the responsibility of the Contractor.

1.04.00 In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements, which are more stringent, shall govern.

1.05.00 All latest codes & standards shall be considered upto the base date. The base date to be considered for codes and standards is fifteen (15) days prior to opening of price bid.

1.06.00 Successful Bidder to furnish two (2) sets of latest International Codes and Standards which have been used for their plants, equipments and system. IS Codes, ASME codes, ASTM codes need not to be furnished. However, International Performance Test Codes shall be furnished as applicable.

2.00.00 RESPONSIBILITY FOR DESIGN

2.01.00 The Contractor shall assume full responsibility for the design of the whole and every portion of the Plant, whether or not the design work was undertaken specifically in relation to the Contract and whether or not the Contractor was directly involved in the design work.

2.02.00 Notwithstanding the Owner's wish to receive the benefits of new, advanced and improved technologies, a prime requirement is that all the systems and components proposed shall have been already adequately developed and shall have demonstrated good reliability under similar, or more arduous conditions elsewhere, at least for continuous 2 years in two different power station.

2.03.00 The successful bidder shall have to carry out surge analysis, BFP transient analysis and other transient condition studies as may be necessary and as required by the Owner as per proven engineering practice.

2.04.00 Bidder shall comply with the requirements of CPCB and MOEF along with specification requirements whichever is stringent.

2.05.00 The Bid shall include a detailed discussion on the development status of, and the reasons for any changes made in proposed systems or components for the Plant, as compared with similar items previously supplied in other installations cited by the bidder as reference plants.

2.06.00 The Bidder may also make alternate offers, provided such offers are superior in his opinion in which case adequate technical information, operating feed back, etc. are to be enclosed with the offer, to enable the Owner to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumptions, etc. shall be clearly brought out to the Owner to make an overall assessment. In any case, the base offer shall necessarily be in line with the specifications i.e. Base offer shall be as per the technical specifications and the same will be considered for techno-commercial evaluation.

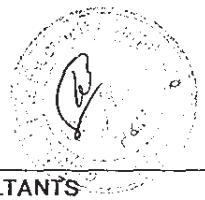
3.00.00 **NAME PLATES (RATING PLATES)**

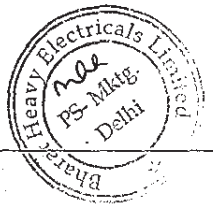
3.01.00 Instruction plates, name plates or labels shall be permanently attached to each main and auxiliary item of plant in a conspicuous position. These plates shall be engraved with the identifying name, type and manufacturers serial number, together with the loading conditions under which the item of plant has been designed to operate.

3.02.00 Items such as valves, etc. which are subject to hand operation, shall be provided with nameplates so constructed as to remain clearly legible throughout the life of the plant giving due consideration to the difficult climatic conditions to be encountered. Nameplates shall be securely mounted where they will not be obscured in service by insulation, cladding, actuators or other equipment. Direction of flow is also to be engraved.

3.03.00 All trade nameplates and labels shall be in English language. All measurements shall be in M.K.S. Units.

3.04.00 The size and location of nameplates shall be subject to Approval of the Engineer.





4.00.00 **SAFETY AND SECURITY**

4.01.00 The design shall incorporate every reasonable precaution and provision for the safety of all personnel and for the safety and security of all persons and property. The design shall comply with all appropriate statutory regulations relating to safety. All structures and equipment shall be designed and constructed to withstand every foreseeable static and dynamic loading condition, including loading under earthquake conditions, with an adequate margin of safety.

4.02.00 Ready and safe access with clear head room shall be provided to all parts of the plant for operation, inspection, cleaning and maintenance.

4.03.00 Escape routes and clear ways shall be provided to allow speedy evacuation of the plant in the event of fire or explosion, and the plant layout shall allow for ease of access to all parts of the Works by rescue and fire fighting teams. The plant layout shall be designed to localise and minimise the effects of any fire or explosion. The recommendations of NFPA, OSHA, and TAC etc. as necessary shall be followed in all respects.

4.04.00 The use of corrosive, explosive, toxic or otherwise hazardous materials shall be kept to a minimum during construction and the design of the plant shall minimise the requirement for such materials during operation and maintenance. Where such materials must be used, all necessary precautions shall be taken in the design, manufacture and layout of equipment to minimise the resulting hazard, and all equipment necessary for the protection and first-aid treatment of personnel in the event of accidents shall be provided. Particular attention is drawn to avoid the use of materials containing asbestos in any form.

5.00.00 **GUARDS**

5.01.00 Effective guards and fences must be provided to prevent injury to operators through accident or malpractice.

5.02.00 Mesh guards which allow visual inspection of equipment with the guard in place are generally preferable. The guards shall be constructed of mesh attached to a rigid framework of mild steel rod, tube, or angle and the whole galvanised to prevent loss of strength by rusting or corrosion. The guards shall be designed to facilitate removal and replacement during maintenance.

5.03.00 All drive belts, couplings, gears, sharp metallic edges and chains must be safely guarded. Any lubricating nipple requiring attention during normal running must be positioned where they can be reached without moving the guards.

5.04.00 Guards for couplings and rotating shafts shall be in accordance with BS 5304-1975 or similar approved standard. All rotating shafts and parts of shafts must be covered.

5.05.00 Suitable fencing shall be provided to enclose all openings or doorways used for the hoisting and lowering of machinery etc. This fencing must be securely fixed but quickly detachable when required. A secure hand hold must be provided on each side of the opening or doorway.

6.00.00 LOCATION AND LAYOUT REQUIREMENTS

The majority of plant and equipment (excluding steam generator and some other auxiliaries) shall all be of indoor installation. A broad list of buildings housing such equipment is given elsewhere in this specification. Layout should facilitate access for operation-maintenance and inspection of any one or more equipment/components at a time without disturbing the operation or installation of rest of the plant. Further, Bidder should comply with the criteria given under the various equipment and system specifications as well as those stipulated in Annexure-II attached to this section.

Enclosed General Layout and other tender layout drawings show the location of major installations and auxiliary buildings. The Bidder shall try to retain these locations as far as practicable. The layout of equipment within the power house as shown in the tender drawings is indicative. The Bidder may, subject to Owner's approval alter the same to suit the space requirement of the equipment offered.

Bidder may give as an alternative his own preferred layout clearly indicating the advantages and other implications, if any. Such alternative will not be considered for evaluating the bid, but may be considered with the successful Bidder if Owner/Engineer finds the proposal more attractive in terms of techno-economic consideration.

While developing the layout of buildings the following criteria shall be given effect :

a) The minimum width of clear access corridors around equipment shall be one (1) meter.

b) Each building shall have an identified vacant space for equipment unloading and maintenance and preferably a separate bay altogether in buildings housing heavy equipment. Provision for handling equipment by monorail hoist and/or overhead crane shall be made as specified.

c) The minimum clear height available between two consecutive floor slabs shall not be less than five (5) meters. A clear head room of two (2) meters shall be maintained between the floor and any overhead piping/ cables or other obstruction. Adequate provision for natural ventilation and illumination shall be made as per good engineering practices.

d) There shall be at least two (2) nos. main access doors, one on either side of each building, of which one shall be minimum 3 meters wide with rolling shutters for equipment entry. For multistoried buildings, at least two (2) nos. regular staircases diagonally opposite to each other shall be provided connecting all the floors and roof. These minimum requirements shall be augmented as required depending on the floor area, statutory requirements and TAC recommendations.

e) All buildings shall have provision for toilet and associated effluent discharge system together with facility for drinking water. The criteria for ventilation, fire protection and illumination of building spaces specified elsewhere in this specification shall be complied with.

052

Bharat Heavy Electricals Limited PS-Mktg. Delhi

f) All rail/road crossings for pipe/cable racks shall be done with minimum 7 meters clear headroom. Similarly top cover over underground pipes/cables shall be minimum one (1) meter. For other detail refer to Annexure-II.

g) Cubicle for operating personnel shall be located at safe place near the equipment.

h) All underground cables in the plant shall be placed in covered reinforced concrete cable trenches. Pipes shall in general be routed above ground and on pedestals, and at road crossings, pipe racks shall be provided. Cable racks / pipe racks shall have hand railings in walkways on both sides at appropriate heights.

i) Concept of various mechanical and electrical equipment location and building dimensions as shown in Plot Plan/Floor Plan drawing are to be adhered to.

However, size of buildings & facilities as stated above, shall be finalized by EPC Contractor considering the basic design criteria of layout as indicated in the specification.

7.00.00 OPERATION, MAINTENANCE & AVAILABILITY CONSIDERATIONS

7.01.00 Equipment/works offered shall be designed for high availability, high reliability, low maintenance and ease of operation & maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability, availability, operability and ease of maintenance. He shall also furnish details of availability records in plants stated in his experience list.

7.02.00 Ample space for ease of operation and maintenance including equipment removal, tube bundle/cartridge/rotor pulling etc. shall be provided. All valves, gates, dampers and other devices shall be located and oriented in such a way that they are accessible from operating floor levels. Where this cannot be adhered to, platforms and walkways with access ladders shall be provided to facilitate operation and maintenance.

7.03.0 Motorised lifting devices, i.e. hoists, chain pulleys, jacks, etc. shall be provided for handling and carrying out maintenance of any equipment and/or part having weight in excess of 3000 Kg. Suitable beams, hooks etc. for this purpose shall be provided in the buildings.

No lifting arrangement is necessary for part having weight less than 500 Kg. Hoist shall be well protected by environment. Suitable painting and coating covering hoist at outdoor shall be provided.

Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist/crane shall be provided by the Bidder for lifting the equipment, accessories covered under this specification.

7.04.00 All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same material and workmanship as the corresponding parts of the equipment. Where feasible common components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.

8.00.00 MATERIALS

8.01.00 In selecting materials of construction of equipment, the Contractor shall pay particular attention to the atmospheric conditions existing at the Site and the nature of material/fluid handled. Wherever deviations are taken in respect of materials specified, the reasons shall be spelt out clearly in the proposal.

All materials shall be new, and shall be of the quality most suited to the proposed application.

8.02.00 In as far as is possible; materials shall be in accordance with Indian or international standard specifications and shall be used in accordance with Indian or international codes of practice. Where such standards or codes of practice are not available sufficient information shall be provided to allow the Engineer to assess the suitability of the material for the particular application.

All materials used shall have performed lengthy satisfactory service in similar or more arduous conditions to those proposed by the Contractor.

8.03.00 All parts which could deteriorate or corrode under the influence of the atmospheric, meteorological or soil conditions at the Site, or under the influence of the working conditions shall be suitably and effectively protected so that such deterioration or corrosion is a minimum over the life of the plant.

9.00.00 LUBRICATION

9.01.00 Provision shall be made for suitable efficient lubrication where necessary to ensure smooth operation free from undue wear.

9.02.00 Non ferrous capillary tubing shall be used throughout.

9.03.00 Gear boxes and oil baths shall be provided with filling and drain plugs, both of adequate size. An approved means of oil indication including level switches and temperature indication shall be provided.

9.04.00 All high speed gears shall be oil bath lubricated. Low speed gears shall be lubricated by means of soft grease. Removable and accessible drip pans shall be provided to collect lubricant which may drop from operating parts.

9.05.00 All lubrication points shall be conveniently situated for maintenance purposes. It must be possible to carry out lubrication from a gangway or landing and without the removal of guarding or having to insert the hand into it. Where accessibility to a bearing for oiling purposes would be difficult a method of remote lubrication shall be fitted.

9.06.00 The Contractor shall supply grease gun equipment suitable to service each type of nipple fitted.

10.00.00 LUBRICANTS AND CONTROL FLUIDS

10.01.00 The Contractor shall provide a detailed and comprehensive specification for all lubricating oils, greases and control fluids required for the entire plant. A sufficient supply of these shall be provided by the Contractor for initial commissioning, first fill and till COD of respective units.

10.02.00 The Contractor shall supply a detailed schedule giving the lubricant testing, cleaning and replacement procedures. All equipment and facilities necessary for the testing, cleaning and changing of lubricants and control fluids shall be provided. The Contractor shall endeavor to reduce the varieties and grades of required lubricants and control fluids to a minimum, matching them where possible to those already in use in the generating station in order to simplify procurement and minimise storage requirements. All lubricants and control fluids shall be of internationally recognised standards and shall be easily obtainable from a large number of Indian suppliers. Bidder shall also indicate the equivalent Indian Standard for the above for easy procurement in future.

10.03.00 No lubricant or control fluid shall have toxic or other harmful effects on personnel or on the environment.

11.00.00 OPERATION AND MAINTENANCE

11.01.00 The plant shall be designed and constructed so that operation and maintenance manpower requirements are minimised.

The design and layout shall facilitate inspection, cleaning, maintenance and repair. The importance of continuity of operation is second only to that of safety.

11.02.00 Spare parts for equipment shall be interchangeable with the original components and, so far as possible, be of common design and manufacture.

11.03.00 All similar standard components/parts of similar standard equipment provided shall be interchangeable with one another. Further identical equipments shall be provided for similar duties so that the same are interchangeable with one another in totality and component wise.

11.04.00 All heavy parts (500 Kg and above) must be provided with a convenient arrangement for slinging and handling during erection and overhaul. Any item of plant normally stripped or lifted during periods of maintenance and weighing one tonne or above, shall be clearly marked with its weight.

11.05.00 On completion of commissioning, a complete set of tools for the maintenance of the entire plant shall be provided by the Contractor. This shall include all necessary spanners, special wrenches, extraction equipment and any special tools reasonably required by the Engineer. Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

11.06.00 All equipment and major valves should be provided with adequate maintenance approach and facility.

12.00.00 **PLANT LIFE AND MODE OF OPERATION**

The complete plant including all the equipment and systems individually and collectively shall be designed for continuous operation for an economic service life of thirty (30) years under the prevailing site conditions and for the type of duty intended.

The critical components of the Steam Generator, Turbine-Generator and Auxiliary equipment, the life of which is limited by time and temperature dependent mechanisms such as thermal stress, creep and low cycle fatigue, are to be designed considering expected (hot, warm and cold) start-up, shut-down and cyclic load variations.

The allowable stresses shall be reduced so that life expectancy to minimum 2,00,000 hours of operation can be achieved. The Bidder shall discuss this aspect in his technical proposal.

The unit would be operated on base load with cyclic load variation. The load variation is expected to be as per schedule depending on power demand.

The expected start-ups should be considered as minimum
(Based on HPT metal temperature)

Cold start-up (>50 hrs. shutdown)	:	20 per year
Warm start-up (between 10 to 50 hrs. of shutdown)	:	40 per year
Hot start-up (less than 10 hrs. shutdown)	:	180 per year

13.00.00 **PACKAGING & MARKING**

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials, the limitations from the point of view of availability of railway wagon sizes in India should be taken account of. The details of various wagons normally available with Indian Railways for transportation of heavy equipment shall be considered by the Bidder. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

As per the information available, the dimensions of OD consignment for transportation of the equipment by rail (if any equipment to be handled through rail transportation) are as below :

a)	Width of the Package (from centre-line of rails - 1.6 metres on both sides)	:	3.2 Meters
b)	Height of the package from rail top	:	4.47 Meters

The above indicates the dimensions which can be normally transported on the wagons without infringement of the "moving gauge". This is however not indicative of the consignment which can be carried out with infringement of "moving gauge" duly authorised and approved by the Indian Railways. There may be difference between the "moving gauge" and the "fixed structure gauge" and consignments infringing the "moving gauge" can be moved after investigation regarding possible infringement with the fixed structures. As the critical fixed structures in each route are different, consignments infringing moving dimensions have to be individually investigated to select a route and also determine the restrictions under which such movement is to be carried out. Such routes selected or other mode of transport envisaged is to be clearly brought out in the proposal wherever transport of over dimensional equipment is involved.

Bidder to consider unloading of material delivered through rail transportation, at near by railway station/site unloading siding. The subsequent transportation up to project work place shall be considered by road only. All unloading and handling equipment both at railway station siding and at project site shall be arranged by the Bidder. Necessary arrangement to be organized with the railway authority for such purpose shall also be under the scope of services if the Bidder. Bidder may consider entire material delivered up to site through rail transportation only.

The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement. Each package shall be accompanied by a packing note (in weather proof paper) quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

For imported equipment and material, suitable port facilities may be used in which case material may be transported from the port by tractor-trailer. Bidder may consider this aspect.

14.00.00 PROTECTION

Equipment having antifriction or sleeve bearings shall be protected by weather-tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces that are damaged shall be repainted.

Electrical equipment, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound as specified above and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors.

All piping, tubing and conduit connections on equipment and other equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.

Returnable containers and special shipping devices shall be returned by the manufacturer's field representative at the Contractor's expense.

15.00.00 PAINTING

15.01.00 General

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the approval of the Owner.

All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the Engineer. The quality and vendor of the paints shall require approval of the Owner.

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

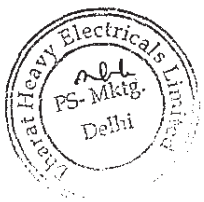
All primers shall be well marked into the surface, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the equipment. If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat.

Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the Engineer. Spray guns shall not be used outdoors in windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment.

Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.

Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel.

058



The Contractor shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

Shop primer for steel and iron surfaces which will have a continuous operating temperature below 35 Deg.C shall be selected by the Contractor, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35 Deg.C.

The colour scheme shall be submitted during execution of contract for approval by the Purchaser/Engineer.

15.02.00 **Preparation**

Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.

Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed.

The priming coat shall be applied without delay.

15.03.00 **Damaged Paintwork**

Any damaged paintwork shall be made good as follows :

a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.

b) A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50mm around the perimeter of the original damage.

c) The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

15.04.00 **Painting Systems**

The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.

a) Surfaces Subject To Weathering

All surfaces shall have a minimum of four coats of paint made up as follows :

Primer coat	:	35 micron DFT
Tie coat	:	35 micron DFT

Finishing coat (2 Nos.) : 35 micron DFT per coat

The total minimum DFT shall be 140 micron.

b) Surfaces Inside Buildings

All surfaces shall have a minimum of three coats of paint made up as follows:

Primer coat : 35 micron DFT

Tie coat : 35 micron DFT

Finishing coat (2 Nos.) : 25 micron DFT per coat

The total minimum DFT shall be 120 micron.

The type and colour of primer & finish coat shall be selected by the Contractor after approval by the Owner.

For detail painting on building & structural steel elements refer Section-IIG/1 & IIG/2 of this specification.

16.00.00 **COLOUR CO-ORDINATION & FINISH**

16.01.00 Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.

16.02.00 Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to; the comfort, well-being and high productivity of the operators. Operating plant and services provided shall be colour coded for ease of identification.

16.03.00 All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.

16.04.00 Final colours and finishes shall be to the Approval of the Engineer.

17.00.00 **ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT**

17.01.00 **Environment Protection**

The plant shall be designed for installation and operation in harmony with the surrounding environment and all measures of pollution control shall be ensured by the Bidder to restrict pollution from the liquid effluent and stack emission within the limits as given below with due consideration of Environment (Protection) Rules 1986 as amended till date.

In case the Ministry of Environment & Forest stipulate any other conditions not specified hereunder while clearing the project shall be complied with the plant by the contractor.

17.01.01 For Liquid Effluent

a) Provision laid down in schedule-I for Thermal Power Plants and also in Schedule-VI. General Standards for discharge of Environmental pollutants Part-A : Effects of Environmental (protection) Rules 1986, as amended till date.

b) Any specific requirement of State Pollution Authorities over and above the above stipulation.

17.01.02 For Air Emission

a) Suspended Particulate Matter i.e. dust burden at chimney outlet - Maximum 50 mg/Nm^3 (with worst coal and one field out).

b) NO_x - 365 ppm Max. or 750 mg/Nm^3 (Equivalent NO_2).

c) SO_2 - Concentration based standard 2000 mg/Nm^3 Load based standard 0.2 metric tonne /MWe/day (for first 500 MW and 0.1 metric tonne/MWe/day for rest of the capacity above 500 MW)

NO_x and SO_2 limitations are based on the World Bank Norms.

In absence of Indian Standard for emission from power plants as on date, for certain gaseous effluents, the internationally accepted World Bank Standard is to be followed. Indian Standard for emission of power plants are under formulation. Should this standard is published before finalisation of the contract, the bidder has to comply the more stringent of the above norm or the new Indian Standard.

The bidder shall include in his scope all necessary equipment and measuring instruments to comply with above requirements. Location and accessibility of the instruments shall be properly coordinated.

17.02.00 **Noise Level Requirement**

The plant will be designed, constructed and provided with suitable acoustic measures to ensure the noise level criteria as per the following stipulations.

a) Maximum noise level shall not exceed 85 dB (A) when measured at 1.0M away from the noise emission source.

b) Maximum noise level from its source within the premises shall not exceed 70 dB (A) as per Environment (Protection) Rules 1986, Schedule-III, `Ambient Air Quality Standards' in respect of noise.

c) Any statutory changes in stipulations regarding noise limitation that may occur in future according to State Pollution Control Board or Central pollution Control Board or Ministry of Environment & Forest regulation during tenure of the contract, the contractor shall comply with the requirement.

An exception will be made for the plant at startup operations and other big pressure reducing devices operating during emergency periods and for the safety valves.

18.00.00 **INSPECTION AND TESTING**

18.01.00 **Inspection and Tests during Manufacture**

18.01.01 The method and techniques to be used by the Contractor for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner prior to the Award of Contract.

18.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.

18.01.03 Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.

18.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Contractor may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.

The Contractor shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Distribution of six (6) copies of Test Certificates for approval will be two(2) copies to owner and four(4) copies to consultant. These four(4) copies will be further distributed by consultant after approval to owner, site and bidder. One copy will be retained with the consultant for record purpose.

Further, nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere. Distribution of nine (9) copies of Shop Test Certificates for approval will be Two (2) copies to owner, Three (3) copies to site, Two (2) copies to consultant, Two (2) copies to owner's library / record.

18.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.

18.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.

Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Contractor shall allow for trial assembly prior to despatch from place of manufacture.

18.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser as per Owner's approved QAP. The certificates shall include tests for mechanical properties and chemical analysis of representative material.

18.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.

18.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.

18.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnuflux and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed.

18.01.11 Statutory payments in respect of IBR approvals including inspection for design and manufacturer of equipment shall be made by the Bidder. All payment for erection and testing at site (i.e. under IBR jurisdiction) shall also be made by the Bidder. In such case Contractor's scope shall also be extended to preparation of all necessary documents, co-ordination and follow-up with IBR authorities for above approval.

18.02.00 **Performance Tests at Site**

18.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Contractor on site under normal operating conditions. The Contractor shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.

18.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.

18.02.03 The Contractor shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.

18.03.00 For details of specific tests required on individual equipment refers to respective section of this specification.

19.00.00 TRAINING OF OWNER'S PERSONNEL

The Contractor shall extend all possible assistance and co-operation to the Purchaser regarding the transfer of technology and developing expertise in the area of engineering operation and maintenance of the Plant.

Number of man-days of training as mentioned below shall be included in his Tender.

19.01.00 **Training at Contractor's Premises**

The Contractor shall conduct training of sixty (60) engineers of the Owner on engineering, operation and maintenance of the Plant at the Contractor's or Associates or Sub-contractor's premises where adequate training facilities are available during the design and manufacturing stage of the Contractor.

The total man-months for training of engineers shall be maximum sixty (60), having following indicative break-up :

Discipline	No. of Engineers	No. of Man-month
Operation	20 heads	20
Maintenance Boiler, Turbine, Mechanical	20 heads	20
Electrical Maintenance	8 heads	4
Control & Instrumentation	8 heads	4
Maintenance Planning	4 heads	2
	60 heads	60

However, the details of the training programme will be discussed and finalised with the successful Bidder.

The training may also be arranged by the Contractor in any Plant where the equipment manufactured by the Contractor or his Associates is under installation, operation or testing to enable the trainees to become familiar with the equipment being furnished by the Contractor. All expenses inherently related to the training shall be borne by the Contractor and shall include but not limited to travel expenses (international and inland fares), lodging and per diem charges as well as medical insurance, instructors fee, programme and miscellaneous cost to be incurred during the training.

The training programme shall be adequate for the trainees to acquire the necessary expertise and competence in the area of engineering, operation and maintenance and as trainers for in-house technology transfer programme of the Purchaser.

064

Bharat Heavy Electricals Limited PS-Mktg. Delhi

The Contractor shall be responsible for the development of the Training Module and Programme Schedule which shall be submitted to the Purchaser for approval.

The components of the training modules shall include but not be limited to the training procedures/methodology, instructional materials such as audio visual materials, CDs and slides and manuals for each trainee.

Three (3) sets of the materials included in the training modules shall be handed over to the Purchaser upon completion of the training. An evaluation shall be jointly undertaken by the Contractor and the Purchaser's representative on the adequacy, appropriateness and relevance of the training and the programme effectiveness after the training. The training material shall be in English language only.

The content of the training programme shall include but not be limited to :

1. Coal fired thermal plant principles in management and practice for operators, technicians and maintenance personnel.

2. Plant operation and systems training for operators including simulator training as applicable.

3. Maintenance training programme covering electrical, mechanical and instrumentation and control.

Said training programme shall be submitted to the Purchaser for approval.

The timing of the training should be such that the participants will be conversant with sufficient know-how to participate in the pre-commissioning and commissioning tests of the Plant.

The Contractor shall provide qualified English speaking instructors and training coordinator(s) during the tenure of the training programme.

19.02.00 **Operation and Maintenance Training at Site**

The Contractor shall provide a comprehensive training programme related to design application, plant management, operation and maintenance, including trouble shooting, of the Contractor's supplied system and equipment at the Site starting from Start of Commissioning and thereafter up to the Final Acceptance of the first Unit.

The following instructors shall be at the Site continuously during the training :

a) One (1) for Steam Generator and Auxiliaries ;

b) One (1) for Turbine Generator and Auxiliaries ;

c) One (1) for Electrical Works ;

d) One (1) for Instrumentation and Control (Boiler and Auxiliaries) ;

e) One (1) for Instrumentation and Control (Turbine and Auxiliaries).

19.03.00 **On-the-Job Training**

During the period of pre-commissioning, commissioning and trial operation, the Purchaser shall provide operation and maintenance personnel to assist the Contractor in the operation and maintenance of his supply and work under the direction of the Contractor for the purpose of on-the-job training.

The Purchaser shall have the right to send to the Site his employees later intended to operate and maintain the equipment supplied under this Contract. The Contractor shall, without additional cost, use his site staff to instruct these employees on the operation and maintenance of the equipment. All instructions shall be in the English language.

20.00.00 **DEVIATIONS**

The Bidder is required to submit with his proposal in the relevant schedules a detail list of any and all deviations taken by him clearly without any ambiguity. In the absence of such a list it will be understood and agreed that the Bidder's proposal is based on strict conformance to this specification and no post-contract negotiations would be allowed in this regard.

Unless otherwise specifically indicated in the deviation list, it will be construed and agreed that details indicated in documents & drawings furnished by the Bidder along with the offer is in-line with the specification requirement.

ANNEXURE-I

LIST OF STANDARDS FOR REFERENCE

a) International Standards Organisation (ISO).

b) International Electro-technical Commission (IEC).

c) American Society of Mechanical Engineers (ASME).

d) American National Standards Institute (ANSI).

e) American Society for Testing and Materials (ASTM).

f) American Institute of Steel Construction (AISC).

g) American Welding Society (AWS).

h) Architecture Institute of Japan (AIJ).

i) National Fire Protection Association (NFPA).

j) National Electrical Manufacturer's Association (NEMA).

k) Japanese Electro-technical Committee (JEC).

l) Institute of Electrical and Electronics Engineers (IEEE).

m) Federal Occupational Safety and Health Regulations (OSHA).

n) Instrument Society of America (ISA).

o) National Electric Code (NEC).

p) Heat Exchanger Institute (HEI).

q) Tubular Exchanger Manufacturer's Association (TEMA).

r) Hydraulic Institute (HIS).

s) International Electro-Technical Commission (IEC) Publications.

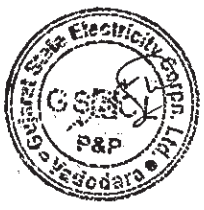
t) Power Test Code for Steam Turbines (PTC).

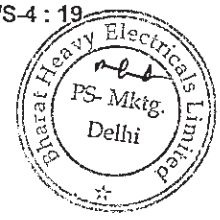
u) Applicable German Standards (DIN).

v) Applicable British Standards (BS).

w) Applicable Japanese Standards (JIS).

x) Electric Power Research Institute (EPRI).





y) Standards of Manufacturer's Standardization Society (MSS).

z) Bureau of Indian Standards Institution (BIS).

aa) Indian Electricity Rules.

bb) Indian Boiler Regulations (IBR).

cc) Indian Explosives Act.

dd) Indian Factories Act.

ee) Tariff Advisory Committee (TAC) rules.

ff) Emission regulation of Central Pollution Control Board (CPCB).

gg) Pollution Control regulations of Dept. of Environment, Govt. of India

hh) Central Board of Irrigation and Power (CBIP) Publications.

ii) The Air Prevention and Control of Pollution Act.

jj) The Environmental Protection Act

kk) The Public Liability Insurance Act.

ll) The Forest Conservation Act

mm) The Wildlife protection Act.

nn) The EIA Notification, 1994.

oo) IS: 14665-Specification for Electric Traction Lift

pp) Any other statutory Codes/Standards/Regulations

ANNEXURE-II

SCHEDULE OF PERMITS & CLEARANCES

Sl. No.	Clearances	Authority	Responsibility
1.0	STATUTORY CLEARANCES		
1.1	Pollution clearance, water and air [Sec.25 of the Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988, and Sec. 21 of the Air (Prevention & Control of Pollution) Act, 1981 as amended in 1987]	Gujarat State Pollution Control Board	Owner-Consent to establish the project. Contractor - Permission for operation
1.2	Environmental clearance	Ministry of Environment & Forest, Government of India	Owner
1.3	Aviation Clearance	Airport Authority of India, New Delhi.	Owner
2.0	NON-STATUTORY CLEARANCES		
2.1	Land availability at Plant area	Govt. of Gujarat / Private land Owner, if any	Owner
2.2	Land for Transportation of Coal	Govt. of Gujarat / Private Land Owner, if any	Owner
2.3	Transportation of Fuel (Secondary Fuel)	Department of Petroleum and Natural Gas, Ministry of Railways, Shipping and Surface Transport	Owner
2.4	Rights & right to access of all public roads from manufacturer's works to site,	Concerned Authorities	Contractor
3.0	OTHER CLEARANCES/ APPROVALS		
3.1	Approval and Registration of steam generator as per Indian Boiler Regulation	Chief Inspectorate of Boilers	Contractor
3.2	Approval as per Indian Electricity Act and Rules for Electrical Installation	Electrical Inspectorate	Contractor
3.3	Approval as per Indian Petroleum Act and Petroleum Rules for storage of petroleum products.	Chief Controller of Explosives	Contractor
3.4	Approval as per gas cylinder rules and handling and transport of compressed gases	Chief Controller of Explosives	Contractor
3.5	a) Collection, storage and disposal of waste during construction till handing over of the project.	Gujarat State Pollution Control Board	Contractor

690

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Sl. No.	Clearances	Authority	Responsibility
	b) Site clearances, safe report and safety audit during construction till handing over of the project.	Gujarat State Pollution Control Board	Contractor
3.6	Approval of Fire Protection Scheme	Authorised Agencies approved by Insurance Regulatory Development Authority, New Delhi (IRDA)	Contractor
3.7	Consent for use of the site for the construction and operation of the Power Station and Fuel Facility	Directorate of Town and Planning of Government of Gujarat	Owner
3.8	Consent for the development of Project Site and the Township site	Directorate of Town and Planning of Government of Gujarat	Owner
3.9	Approval of the proposed design and construction of power station	Chief Inspector of Factories of Government of Gujarat	Contractor
3.10	Allocation / approval of electric supply for bulk construction power	Gujarat State Electricity Dept.	Owner
3.11	Carriage entrance to property	Municipal Corporation: Assistant Engineer, Roads or concerned authorities	Contractor
3.12	Approval of building layout with fire safety concerns and receipt of No Objection Certificate	Municipal Corporation: Chief Fire Officer or concerned authorities	Contractor
3.13	No Objection Certificate regarding air & fugitive emissions	Municipal Corporation: Executive Engineer and Gujarat Pollution Control Board	Contractor
3.14	No objection Certificate for Chimney and Registration	Inspector of Smoke Nuisance	Contractor
3.15	No Objection Certificate for sewage water treatment and associated plumbing	Municipal Corporation: Executive Engineer, Sewerage and Planning or concerned authorities	Contractor
3.16	To review the frequency used for Power Line Carrier Communication (PLCC) system to ensure no interference with other power line users	Postal Tele communication Coordination Committee (PTCC)	Owner-PLCC Contractor- Wireless equipment (postal telecommunication)
3.17	No objection certificate for plant layout with regard to electrical equipment, operational safety	Chief Electrical Engineer of Gujarat	Contractor
3.18	No Objection Certificate for storage of construction Materials and chemicals, etc.	Municipal Corporation: Assistant Engineer, Factory Department	Contractor

Sl. No.	Clearances	Authority	Responsibility
3.19	No Objection Certificate for storage of construction fuel oils and chemicals, etc.	Commissioner of Police	Contractor
3.20	No Objection Certificate for storage of Distillate Oil	Chief Controller of Explosives	Contractor
3.21	No Objection Certificate for road opening and asphalting Work including traffic Work.	Municipal Corporation: Assistant Engineer, Roads or concerned authorities	Contractor
3.22	Local approval for operating the plant	Municipal Corporation: Ward Office or concerned authorities	Not applicable
3.23	Local approval of Architectural plans for township	Municipal Corporation or concerned authorities	Owner
3.24	Consent under the Factories Act, 1948 relating to fire fighting capacities	Directorate of Town and Planning of Government of Gujarat	Contractor
3.25	Clearance of Lifts	Inspector of Lifts, Govt. of Gujarat	Contractor
3.26	Approvals / clearances for labour / man power like License from labour commissioner for Construction labour, Registration of Workers or exemption to be claimed if group insurance taken for some, etc.	Concerned Authorities	Contractor
3.27	Any other clearances	Appropriate Authorities	Contractor
3.28	Export Authorisation (Export license)	Appropriate Authorities of exporting country	Contractor

071

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PS-Mktg.
Delhi

ANNEXURE-III

CRITERIA FOR LAYOUT

PLOT PLAN LAYOUT REQUIREMENTS

	ITEM	SPECIFICATION REQUIREMENT
A.	Site conditions to be considered	
1.	Prevalent wind direction	See wind-rose in plot plan. Also refer Metrological Data.
B.	Layout Requirements	
1.	Maximum permissible slope in	
a)	Rail track	1 in 400
b)	Road	1 in 30
c)	Sides of unpaved embankment	1 in 2
2.	Required road width	
a)	Main roads Refer Vol. II-G.	
b)	Auxiliary interconnections Refer Vol. II-G.	
c)	Road to the power house unloading bay :	
	• Only for entry to the unloading bay	Yes
	• To pass through the unloading bay	No
3.	Required minimum horizontal distance between the nearest points of	
a)	Plant boundary and the boundary of residential area	(Local municipality/factory rule)
b)	Electrical transformer and any other building/facility	As per the Tariff Advisory Committee Rules
c)	Fire water supply installation and any building/facility subject to fire risk.	As per the Tariff Advisory Committee Rules
d)	Inflammable liquid (fuel oil, etc.) storage & handling installation and their fencing and other buildings/facilities.	Rules of the Indian Explosive (Indian Explosives Act) and Indian Petroleum Code

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072

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	ITEM	SPECIFICATION REQUIREMENT
4.	Required minimum vertical clearance	
a)	Under pipes/cable racks at road crossings	7.0 Metres
b)	Soil coverage over underground pipes	1.0 Metre (minimum)
c)	Pipe/Cable trench	Not Acceptable
5.	Railway Wagon clearance	Rules of the Indian Railways
6.	Minimum Clearance between any road edge and building/structure/ any fixed installation.	3 Metres
7.	Required level, above the local developed grade level, of	
a)	top of all roads	150 mm
b)	all outdoor paved areas	150 mm
c)	Temporary storage areas, workshops, offices, residence etc. required at the time of erection work.	Yes
d)	Green belt around power plant area	As per environmental guidelines of MOEF, Govt. of India.

BUILDING/ EQUIPMENT LAYOUT REQUIREMENTS

A.	Minimum clear space required at all working and walking areas for operating & maintenance personnel	
1.	Horizontal, in all directions	
a)	Adjacent to any electrical equipment, electrical cables, running (rotating/reciprocating) equipment, safety valve or vent/drain pipe outlet, pipe/ equipment of surface temperature exceeding 60°C.	1200 mm
b)	Adjacent to any other plant facilities (including walls/structures)	1000 mm
2.	Vertical (head-room clearance)	
a)	Under any pipe/equipment surface of temperature exceeding 60°C and any electrical cables or other electrical items.	2.0 Metre
b)	Under any other plant facilities (including structures, pipes etc.)	2.0 Metre

	ITEM	SPECIFICATION REQUIREMENT
3.	For all areas where any equipment (including trucks, trolleys and other material handling equipment) will move or maneuver.	Minimum 500 mm clear in all direction from the outer edges of the equipment
4.	Minimum clear hand space required for	
a)	The application of thermal insulation	100 mm
b)	Welding work	150 mm
c)	Bolt tightening	150 mm
B.	Floors, platforms, staircase, ladders, walls, doors & windows	
1.	Statutory Requirement	As per the regulations of Tariff Advisory Committee, Indian National Building Code, Indian Factories Act, Local Municipal Rules, etc.
2.	Operation & Maintenance Requirement	
a)	Adequate floor space shall be kept to permit dismantling, temporary storing and in-situ maintenance of plant & equipment parts, satisfying the clear space requirements stated above. A separate unloading bay for such purpose is required.	Yes
b)	Floors or fixed/portable platforms with stairs/ ladders shall be provided for easy approach to any plant item, including valves, instruments, etc. to be operated, observed and/or to be frequently (more than once a month) maintained.	Yes
3.	Plinth level of all buildings, above the local developed for power house building.	300 mm, however, 500 mm grade level
4.	Minimum access opening required (with rolling shutter) transportation,	3.5M wide x 4M high or, wherever entry of truck, for material more depending upon the is envisaged equipment size to be handled.

074

	ITEM	SPECIFICATION REQUIREMENT
C.	Other Maintenance Requirement	
1.	Generator stator handling In case the Generator stator cannot be handled by the turbine house crane, all provisions for its overhauling, including the arrangement to slide the stator on the turbine house floor, the foundation work for stator jacking /lowering assembly, dismantling of building end walls/structures etc. shall be kept.	Yes
2.	Maintenance of the internals/impellers of all important equipment, like boiler feed pumps, feed water heaters, Surface Condenser, fans of the boiler draft plant, Intake and circulating water pumps, cooling water pumps, coal mills, compressors, blowers, heat exchangers, fuel air oil pumps, filters etc.	Shall be possible without disconnecting or dismantling any piping/ducting.
3.	Overhauling and handling of the casings for the above items	Shall be possible without disturbing/dismantling any piping/ducting not directly connected to them.
4.	Crane Approach Wherever required the unobstructed approach of the crane hook/other hoisting equipment hook to various plant & equipment shall be possible.	Yes
D.	Central Control Room All electronic equipment other than those directly associated with control, operation or presentation of displays shall be mounted external to the control room in air conditioned control equipment room.	Yes
	The bidder shall describe in his bid the proposed layout philosophy of the Central Control Room and Control Equipment Room and the arrangement of equipment best suited for the system offered by him and as per good ergonomically consideration. However, as a guide line, following features are given :	
a)	False ceiling and false flooring shall be provided.	
b)	Uniform height, colouring schemes for cabinets etc. shall be available.	

ITEM		SPECIFICATION REQUIREMENT
c)	The total area of floor space covered by Control Consoles/Panels in the Control Room shall not exceed 15% of floor area.	
d)	No opening shall be provided from Boiler side.	
e)	Two double leaf doors, suitably located for entering the Control room shall be provided with opening towards the turbine floor.	
f)	Cable entry for the panels/consoles shall be from bottom and suitable openings shall be provided.	
g)	The Control Room lighting shall be designed to provide a glare free uniform illumination. The level of illumination shall be minimum 400 LUX.	
h)	Necessary Air Conditioning shall be provided for Central Control room, Control Equipment Room and SWAS room etc.	
i)	Basic amenities like toilet, Tiffin rooms, wash basins, rest rooms etc. shall be provided near the Control Room.	
E.	Toilet and drinking water facility	Required in all buildings and on all floors wherever operating personnel are to be deployed.

SECTION-C2-B
SPECIAL CONDITIONS OF E&C

SECTION-4

SPECIAL CONDITIONS FOR ERECTION AND CONSTRUCTION

1.0 GENERAL

The following items shall supplement the conditions in the other Sections of this Volume.

2.0 SCOPE OF WORK

2.1 Erection Work

The Contractor shall prepare erection drawings and obtain approval of the same from the Owner as applicable.

The Contractor shall receive the imported Goods, if any, at the port of entry, clear them through Customs and make damage report through port broker. The Contractor shall arrange for payment at prescribed rate of Customs Duties, if required by the Owner, which will be reimbursed by the Owner against Contractor's valid documents upto the overall amount specified in the price bid and agreed.

The Contractor shall transport all imported Goods & indigenous goods from port of entry, from manufacturer's works to the Site and unload all Goods at the Site. Crane services shall be provided by the Contractor, if necessary. All storage at port of entry or at railway station shall be at Contractor's cost.

The Contractor shall be responsible for complete installation as per approved drawings, testing, commissioning, trial run of the Plant at the Site and putting the Plant into commercial operation including finish painting work.

All machinery and tools for transportation and erection shall be provided by the Contractor at his cost.

The Goods after receipt at the Site, shall be checked and verified against the shipping documents and all claims made and replacement or repair order against loss or damage in transit shall be intimated to the Owner. The Goods shall remain under the custody of the Contractor until the Plant is taken over by the Owner upon completion of the Work. The Contractor shall take adequate steps to ensure safety and protection of such Goods. Necessary stores receipt certificates shall be issued to the Owner after the Goods are checked and certified.

No Goods pertaining to the Contract shall be removed from the Site without the consent in writing by the Owner.

The Contractor shall be responsible for replacement, free of cost to the Owner, of any material damaged due to improper storage.

The Contractor shall be responsible for setting up correct reference lines for the purpose of fixing alignments of various equipment. The Contractor shall be responsible for replacement, free of cost to the Owner, of any goods damaged/ lost/broken down in any point of operation due to any reason whatsoever while under the custody of the Contractor.

The Contractor shall arrange for, at his cost, all consumables, paints, lubricants, etc. as required.

The contractor shall arrange at his own cost for approvals, clearances, registration, inspections etc. from but not limited to Government authorities, statutory authorities, e.g. Factory Inspector, Boiler Inspector, Electrical Inspector, Explosive Inspector, Municipal corporation, ESI authorities, Labour authorities etc. for design, engineering, supply, erection and commissioning etc.

All surplus/unused materials/scrap materials left after completion of project shall become property of Contractor, provided the materials were brought by the Contractor and the payment was not made for the same by Owner.

2.2 Civil, Structural and Architectural Works

The Contractor shall be responsible for the preparation of the design and all drawings and obtain approval of the same from the Owner when required.

The Contractor shall be responsible for the survey and true and proper setting out of the Works and for the correctness of the positions, levels, dimensions and alignments of the all parts of the Works and shall provide all necessary survey grid-pillars, bench-marks, instruments, appliances and labour in connection therewith. If at any time during the progress of the Works any error shall appear or arise in the positions, levels, dimensions or alignments of any part of the Works, the Contractor, on being required to do so by the Owner/ Engineer, shall at his own expense rectify such errors to the satisfaction of the Owner/Engineer. The checking of the setting out of any line or level by the Owner/Engineer or the Engineer's representative shall not in any way relieve the Contractor of his responsibility for the corrections thereof. The Contractor shall carefully protect and preserve all survey grid-pillars, bench marks, site rails, pegs and other things used in setting out the Works.

The Contractor shall be responsible for all civil, structural and architectural Works as required for the installation of the Plant and its sub-systems and other facilities.

The Contractor shall arrange for supply of all Goods at his cost.

3.0 INSURANCE

In addition to the conditions stipulated in Section-3 of this Volume, the Contractor shall also arrange for insurance coverage as under :

a) **Workmen's Compensation Insurance**

This insurance shall protect the Contractor against all claims applicable

under the Workmen's Compensation Act (Government of India). This policy shall also cover the Contractor against claims for injury, disability, disease or death of his or his sub-contractor's employees, which for any reason are not covered under the Workmen's Compensation Act. The liabilities shall not be less than :

Workmen's Compensation	:	As per statutory provisions
Employee's liability	:	As per statutory provisions

b) **Comprehensive General Liability Insurance**

The insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of members of public or damage to property of others due to any act or omission on the part of the Contractor, his agents, his employees, his representatives and sub-contractors from riots, strikes civil commotion and terrorism.

The hazards to be covered will pertain to all the works and areas where the Contractor, his sub-contractor(s), his agents(s) and his employee(s) have to perform work pursuant to the Contract.

The above are only illustrative list of insurance covers normally required and it will be the responsibility of the Contractor to maintain all necessary insurance coverage to the extent both in time and amount to take care of all his liabilities either direct or indirect, in pursuance of the Contract.

4.0 WORK AT SITE

In the execution of the Work, no persons other than the Contractor, or his duly appointed representative, sub-contractor(s) and workmen employed by him and his sub-contractor(s) shall be allowed to do work at the Site, except by the special permission, in writing, of the Owner or his representative. Access to the Work at all times shall be accorded to the Engineer and representatives of the Owner.

The Contractor shall at all times and at his own cost take sufficient precautions to ensure the safety of public and guard the Site deemed necessary.

The Work at Site shall be carried out without interference with Owner's activities.

No female labour shall be allowed during dark hours.

The Contractor shall not employ for the purpose of executing the Works, any person who is below the age of eighteen (18) years. The Contractor shall pay to each labourer, for the work done by such labourer, wages, not less than the wages paid for similar work in the district.

5.0 MANUFACTURER'S SUPERVISION

If the Contractor is not the manufacturer, he may be required to work under the guidance of the manufacturer's technical personnel. However, this will not

relieve the Contractor of his responsibility for the correctness of work done or quality of workmanship.

6.0 CONTRACTOR'S REPRESENTATIVE

6.1 The Contractor shall employ the necessary competent representatives at the Site, whose name shall have previously been communicated in writing to the Owner/Engineer by the Contractor to supervise the erection of the Plant. The required representatives shall be present at the Site during working hours, and any written orders or instructions which the Owner/Engineer or his duly authorised representative may give to such representative of the Contractor, shall be deemed to have been given to the Contractor.

6.2 The Contractor's representative employed for the purpose of the work at the Site shall be stationed at the Site when the Owner informs the Contractor in writing to that effect.

7.0 FOREIGN PERSONNEL

The Contractor shall bear all expenses in connection of any foreign personnel he plans to bring into India for the performance of the Works.

If the Contractor requires the assistance of the Owner, to the extent possible, to obtain any necessary travel permits for the foreign personnel, the Contractor shall provide the Owner with all necessary data on such foreign personnel. The Contractor shall allow the Owner a reasonable time prior to the proposed date of departure of the foreign personnel, to enable the Owner to provide the assistance required.

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 Competent Authorities.

The Contractor and the foreign personnel shall abide by statutory laws, rules & regulations in force in India at the time thereof & shall not in any way interfere with Indian political and/or religious affairs. The Contractor's foreign personnel shall work and live in close co-operation & 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.

The Contractor shall pay all taxes due in India for the foreign personnel employed by the Contractor for their work in connection with this Contract. The Contractor shall obtain at his own cost "work permits" required from competent authorities to enable the foreign personnel to work in India.

8.0 PROGRAMME OF WORK AND PROGRESS REPORT

The Contractor shall, as required from time to time, submit to the Owner erection and construction schedules in the form of PERT network or bar chart showing the time-table the Contractor proposes to follow to carry out the work with dates and estimated completion times for various parts (milestones) of the Work. Such schedules shall be approved by the Owner, prior to the

commencement of the Work at the Site.

During the progress of the work, the Contractor shall submit copies of monthly progress reports and photographs and such other reports on the erection and construction Works and his site organisation, as the Owner/Engineer may direct. The format of the progress report shall be decided upon by the Contractor with the approval of the Owner. However, if at any time the Owner desires to change the format or requires any additional information, the Contractor shall comply. The Contractor shall also submit an anticipated one (1) months programme at the beginning of each month describing in detail the anticipated programme for the following month. The Contractor shall also submit from time to time, a list of various categories of his employees. Monthly progress reports shall be submitted by the tenth (10th) day of the month following the reporting month.

9.0 INDEMNITY

The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the Owner against all losses and claims in respect of injuries or damage to any person, material or plant, or damage to any property whatsoever but not limited to third party damages which may arise out of or in consequence of the execution of the Works, and against all claims, proceedings, damages, costs, charges and expenses whatsoever in relation thereto.

10.0 CLEAN UP WORK AT SITE

The Contractor shall without any additional payment at all times keep the working and storage areas used by him and/or his sub-contractor(s) free from accumulation of waste materials or rubbish. If these materials are not removed by the Contractor within forty-eight (48) hours, after being requested by the Owner, these will be removed by others and the cost of the same will be charged to the Contractor. Any inflammable materials shall be removed forthwith on request by the Owner.

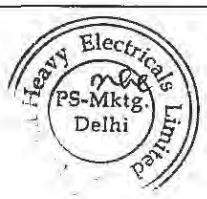
On completion of erection and construction work, the Contractor shall remove or dispose of in a satisfactory manner all temporary structures, packing cases, waste and debris and leave the premises in a condition satisfactory to the Owner. All surplus earth shall be removed beyond the Plant area and dumped in a place(s) as directed by the Owner/Engineer.

11.0 CO-ORDINATION WITH THE OWNER'S ENGINEERS

The Contractor shall at all times work in co-ordination with the Owner's Engineers and afford them every facility to become familiar with the erection and maintenance of the equipment and construction work.

12.0 MATERIALS HANDLING AND STORAGE

The Contractor shall be responsible for examining the shipment and shall notify the Owner immediately of any damage, shortage, discrepancy, etc. for the



purpose of Owner's information only.

The Contractor shall maintain an accurate and exhaustive record detailing of all Goods received by him for the purpose of erection and keep such record open for inspection by the Owner at any time.

All electrical panels, control gear motors and such other devices shall be properly dried by heating before they are installed and energised. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.

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 shall be maintained by the Contractor. Such records shall be open for inspection by the Owner/Engineer.

The Contractor shall ensure that all the packing materials and protection devices used for the Goods during transit and storage are removed before the Goods are installed.

The consumables and other supplies which are likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality during the storage period.

All the materials stored in the open or dusty locations must be covered with suitable weatherproof and flameproof covering material wherever applicable.

If the materials belonging to the Contractor are stored in area other than those earmarked for him, the Owner will have the right to have them moved to the area earmarked for the Contractor at the Contractor's cost.

The Contractor shall be responsible for providing suitable covered storage facilities to store all Goods which require covered storage. Normally, all the electrical equipment such as motors, control gear, generators, exciter and consumables like electrodes, lubricants, etc. shall be stored in the covered storage space. In addition, the Owner, may direct the Contractor to move certain other materials which in his opinion will require covered storage and the Contractor shall strictly comply with his instruction.

13.0 LABOUR AND LABOUR LAWS

13.1 Recruitment of Local Labour

Local labourers shall be engaged for unskilled work. Preference may also be given for appointment of local labourers in semi-skilled and skilled categories, if such suitable labourers are available.

13.2 Labour Laws and Local Regulations

The Contractor shall abide by the prevailing labour laws and shall have to

obtain a labour license from the appropriate authority as per the law at his cost and shall indemnify the Owner against any financial and other obligation in connection with labourers employed by him. On obtaining the labour license, the Contractor at the appropriate time, shall submit a certified photocopy of the same to the Owner.

13.3 **Wages and Working Hours and Conditions**

The Contractor shall pay wages and observe hours and conditions of labour not less favourable than those established for the trade or industry in the district where the work is carried out. In the absence of any wages, hours or conditions of labour so established, the Contractor shall pay wages and observe hours and conditions of labour which are not less favourable than the general level of wages and hours and conditions observed by other contractors whose general circumstances in the trade or industry in which he is engaged are similar.

13.4 **Contractor to furnish return of labour employed**

The Contractor shall, if required by the Owner/Engineer, deliver to the Owner/ Engineer or to his office a return in such form and at such intervals as the Owner/Engineer may prescribe, showing in detail classes of labour employed and the number employed within each class by the Contractor from time to time on the Site and such information in respect of construction machinery as the Owner/Engineer may require.

13.5 The Contractor shall make his own arrangements for the engagement of all labour and provide on the Site in so far as the Contract otherwise provides, for the transport, housing, feeding and payment thereof.

The Contractor shall, so far as is reasonably practical, having regard to local conditions, provide on the Site, to the satisfaction of the Owner/Engineer an adequate supply of drinking and other water for the use of his staff and labour.

13.6 **Other Requirements**

a) The Contractor shall not, other than in accordance with the Statutes, Ordinances and Government Regulation or Orders currently in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor, or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his sub-contractor(s), agents or employees.

b) The Contractor shall not give, barter or otherwise dispose of to any person or persons any arms or ammunition of any kind or permit the same as aforesaid.

c) The Contractor shall in all dealings with labour in his employment have a due regard for all recognised festivals, days of rest and religious or other customs.

d) In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with any regulations, orders and requirements as may be made by the Government, or the local municipal or sanitary authorities for the purpose of dealing with and overcoming the same.

e) The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees.

f) The Contractor shall be responsible for observance by his sub-contractor(s) of the foregoing provisions.

14.0 PROTECTION AND CARE OF WORKS

14.1 The Contractor shall in connection with the Works provide and maintain at his own cost all temporary works, lights, guards, fencing and watching when and where necessary or required by the Owner/Engineer or by any competent statutory or other authority for the protection of the Works.

14.2 From the commencement to the completion of the Works, the Contractor shall take full responsibility for the care of the Works and of all temporary works. If any damage, loss or injury happens to the Works or to any part thereof or to any temporary work from any cause whatsoever (save and except the "Force Majeure" as defined earlier) the Contractor shall at his own cost repair and make good the same so that at completion the works shall be in good order and condition and in conformity in every respect with the requirements of the Contract Documents and the Owner/Engineer's written instructions. The Contractor shall also be liable for any damage to the Works caused by him in the course of any operations he carries out for the purpose of complying with his obligations under the Contract Documents.

15.0 OWNERSHIP OF ARTICLES OF VALUE DISCOVERED AT SITE

All fossils, contains, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the Site shall be deemed to be the absolute property of the Owner. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging the same, and shall immediately, upon discovery thereof and before removal, inform the Owner/Engineer of such discovery and carry out, at the expense of the Owner the Engineer's orders concerning the removal of the same.

16.0 CONVENIENCE OF PUBLIC

All operations necessary for the execution of the Works and for the Construction of any temporary work shall, so far as compliance with the requirements of the Contract permit, be carried on so as not to interfere unnecessarily or improperly with the public convenience of access to use public or private roads and foot paths or to use properties whether in the possession of the Owner or of any other person. The Contractor shall indemnify the Owner in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in relation to any violation by the Contractor of the above.

17.0 PREVENTION OF EXTRAORDINARY TRAFFIC AND PROTECTION OF HIGHWAY

The Contractor shall use reasonable means to prevent the highways or bridges communicating with or on the routes to the Site from being subjected to extraordinary traffic by traffic of the Contractor or any of his sub-contractors. In particular the Contractor shall select routes, choose and use vehicles and restrict and distribute loads, so that any such extraordinary traffic as will inevitably arise shall be limited as far as reasonably possible, and so that no unnecessary damage or injury may be caused to such highways and bridges. If it is found necessary for the Contractor to move over part of highway or bridge, one or more loads, where the moving of such load will in all probability damage the highway or bridge unless means of protection or strengthening are carried out, then the Contractor shall, before moving the load on to such highway or bridge, give notice to the Owner of the weight and other particulars of the load to be moved, and his proposals for protecting or strengthening the said highway or bridge. The Contractor shall also carry out the protection and strengthening of the highway or bridge as required.

18.0 WORK MATERIALS AND PLANT

18.1 Materials and Workmanship

All construction materials, structural steel and workmanship shall be of the respective types described in the Contract Documents, and shall be subjected from time to time to such tests as stipulated in the approved quality assurance plan. The Contractor shall establish on site testing facilities as required by him. Collection of samples and testing as specified in the Contract Documents including special tests, if any, shall be carried out by the Contractor at his cost.

18.2 Examination of the Works

No work shall be covered up or put out of view without the approval of the Owner/Engineer and the Contractor shall afford full opportunity for the Owner/Engineer to examine and assess any work which is about to be covered up or put out of view, and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Owner/Engineer whenever any such work or foundation is ready for examination. The Contractor shall uncover any part or parts of the Works, make openings in or through the same as the Owner/ Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Owner/Engineer. If any such part or parts have been covered up or put out of view after compliance with the requirements of this item and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating and making good the same, shall be borne by the Owner as mutually agreed upon but in any other cases all the such expenses shall be borne by the Contractor or may be deducted by the Owner from any money due or which may become due to the Contractor.

18.3 **Improper Work and Material**

The Owner/Engineer shall during the progress of the works have the right to order in writing from time to time:

a) The removal from the Site within such time or times as may be specified in the Contract Documents of any materials which in the opinion of the Owner/Engineer are not in accordance with the Contract Documents.

b) The substitution of proper and suitable materials, and

c) The removal and proper re-execution (notwithstanding any previous test thereof or interim payment thereof) of any work which in respect of materials or workmanship is not, in the opinion of the Owner/Engineer, in accordance with the Contract Documents.

In case of default on the part of the Contractor in carrying out orders, the Owner shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be borne by the Contractor and shall be recoverable from him by the Owner or may be deducted by the Owner from any money due or which may become due to the Contractor.

18.4 **Temporary Arrangement**

The Contractor shall bear all expenses and charges for special or temporary way-leaves required by him in connection with access to the Site.

19.0 **ERECTION/CONSTRUCTION TOOLS, TACKLES AND MACHINERY**

19.1 **Tools, Tackles and Machinery**

The Contractor shall provide all construction/erection machinery, tools, tackles and scaffolding required for the Works. A detailed list of the above, together with their capacities and present conditions, etc. shall be submitted to the Owner/Engineer at least three (3) months before the commencement of Site work.

19.2 **Exclusive use of Machinery**

All erection and construction machinery, temporary works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Work, and the Contractor shall not remove the same or any part thereof for any other use.

20.0 **URGENT REPAIR WORK**

If, by reason of any accident or failure or other event occurring in connection with the Works, either during the execution of the Works or during the Warranty period, any remedial or repair work is necessary, then the Contractor shall take necessary remedial action. If however the Contractor is unable or unwilling to

do such repairs, the Owner may use his own or other workmen to do the repairs. The cost of repairs so done shall be charged to the Contractor or may be deducted by the Owner from any money due or which may become due to the Contractor.

SECTION-C2-B
GENERAL CONDITIONS

SECTION-3
GENERAL CONDITIONS

1.0 APPLICATION

These General Conditions shall govern the Works.

2.0 DEFINITION OF TERMS AND INTERPRETATION

2.1 Definitions:

- In this Contract (as defined below), unless the context requires otherwise, the words and expressions defined below shall have the meaning hereinafter assigned to them.

- "**Advance Payment Bank Guarantee**" shall have the meaning assigned to the term under Clause 8.2 of this GCC.

- "**Annexure**" shall mean all appendices; annexure, tables and schedules annexed to this Contract or incorporated by reference herein and shall include all amendments and revisions thereto made by mutual agreement of the Owner and Contractor in accordance with the provisions contained in this Contract.

- "**Acceptance Test/Performance Guarantee Test**" for equipment /system shall mean such tests as are required to determine and demonstrate guaranteed capacity, efficiency and operating characteristics of the equipment /system Plant as stipulated in the Contract Document.

- "**Applicable Laws**" shall mean Constitution of India, all laws, treaties, ordinances, rules, directives, regulations and amendments thereto made from time to time and in force and effect in India, judgments, decrees, injunctions, writs and orders of any court, arbitrator or authority, rules, regulations, orders and interpretations of any Governmental Instrumentality, court or statutory or other body having jurisdiction over the subject matter of the Contract, as may be in effect at the time of performance of Work hereunder by the Contractor, provided, however, that if at any time the Applicable Laws are less stringent than the standards set forth in the Contract, Contractor shall not be excused from meeting the standards set forth herein.

- "**Approved**" and "**Approval**", where used in the Contract shall mean respectively, approved by and the approval of the Owner or the Owner's Representative in writing.

  When the words 'Approved', 'Approval', 'subject to Approval', 'Satisfactory', 'Equal to', Proper', 'Requested ', 'As directed', 'Where directed', 'When directed', 'Determined by', 'Accepted', 'Permitted', or words and phrases of like import are used the approval, judgment, direction etc is understood to be a function of the Owner or the Owner's Representative.

- "**Auxiliary Power Consumption**" shall mean the electrical energy (in kW) consumed by all the equipments, systems etc. forming part of the Plant and provided by the Contractor in pursuance of the Contract over a period of one hour i.e. difference of Gross Power measured at Generator Terminals and Net Power measured at 400 KV side of Generator Transformers, when the Plant is operating at rated capacity (guaranteed) measured in accordance with the procedures detailed in the Technical Specifications.

- "**Bidder**" shall mean duly established reputed organizations, manufac-turers, etc. having requisite financial and technical capability and experience of participating in the Bid invited by the Owner for the Works. [

- **"Bank Guarantee" or "Performance Bank Guarantee" or "*Bonds*"** shall mean the primary, irrevocable, and unconditional on demand bank guarantees from Indian nationalized bank, to be furnished by the Contractor as a security for his performance under the Contract and the Advance Payment payable to the Contractor in accordance with Clauses of the General Conditions of Contract.

- "**Cause**" in relation to the revocation or amendment of any Permit shall mean any fact or circumstance, including without limitation any default, neglect or failure to abide by any of the terms and conditions of such Permit, which legally entitles the issuing authority to revoke the Permit or make the relevant amendment in its terms and conditions.

"Ceiling" shall ***mean an upper limit for payment inclusive of applicable taxes & duties, by the Owner to the Contractor for various services rendered in pursuant to Contract as well as deduction towards Liquidated Damages for delay in Commercial Operations or otherwise shortfall in Performance Guarantee***

- **"Contractor"** shall have the meaning assigned to the term in the Contract Agreement and shall include its legal successors in title approved by the Owner, who satisfy the qualification criteria set forth in the Tender Document,

- **"Contract"** or **"EPC Contract"** shall mean the Contract Agreement, Contract and such further documents as may be expressly incorporated in the Contract by reference and all amendments in writing made to any of them in accordance with the provisions contained in this behalf in the Contract and executed by duly authorized representatives of the Parties and shall include such other document that the Parties may have agreed in writing.

- "**Consultant**" shall mean Development Consultants Pvt. Ltd., Consulting Engineers, whose office is situated at GR. HQ.: 24 Park Street, Kolkata – 700 016, or any other agency (engaged for specific purpose) appointed by the Owner for the Project implementation and shall include their duly authorized representatives.

- "**Change in Law**" shall mean the occurrence of any of the following after

[*please insert the date*]:

(a) the enactment of any new Applicable Law.

(b) any modification or repeal of any existing Applicable Law or any new or modified directive or order there under,

(c) Any change in the interpretation or enforcement of any Applicable Laws by a competent legislature of Government Agency in India which is contrary to the existing accepted application or interpretation thereof, provision for which has not been made elsewhere in the Agreement.

provided that "Change in Law" shall not include

(i) any change in the interpretation or application of any Applicable Law except as provided in (c) above; and

(ii) any enactment, modification, repeal, interpretation or application of any Applicable Law of India which increases market prices of goods, commodities, labour and services in general.

- "**Change Order**" shall mean a written order from the Owner to the Contractor after the Commencement Date of the Contract requiring a change in any part of the Work that may involve:

  (a) a change in the scope of Work,

  (b) additional work, or

  (c) the omission of a portion of the Work, and

  (d) if appropriate, an adjustment in one or more of the (i) Contract Price, (ii) Guaranteed Commercial Operation Date, (iii) Milestone Payment Schedule, (iv) any of the Performance Guarantees, or (v) any provision/scope of this Contract including any Appendices or Schedules hereto.

- "**Codes**" or "**Indian Standards and Codes**" shall mean the latest applicable Indian and international technical codes and standards, whether required by statute or not.

- "**Commencement Date**" or "**Zero Date**" shall mean the date on which the Contractor is to commence performance of Work or its obligations under the Contract as specified in the Notice to Proceed delivered by the Owner to the Contractor under and in accordance with the Contract.

- "**Commissioning**" shall mean the first successful operation of each equipment / systems provided by the Contractor, and the Plant as a whole at full load (after the Mechanical Completion), without any problem/interruption, in accordance with the Contract, after all initial adjustments, cleaning, re-assembly, and Trial Run, as required on completion of installation of Plant at site, have been completed.

- **"Commercial Operation"** shall mean, operation of the Plant upon Commissioning and successful completion of all the Tests before Commercial Operation.

- **"Commercial Operation Date"** or **"COD"** shall mean the date mentioned in the Provisional Acceptance Certificate which will be issued by the Owner, upon the satisfactory completion of reliability run and Plant entering into Commercial Operation, and the Plant becoming available for continuous operation on 24X7 basis for commercial sale of power by Owner,.

- **"Company Contractor"** shall mean any Person other than the Contractor under contract with the Owner with respect to the Project.

- **"Completed Performance Test"** shall mean with respect to each equipment / systems / Plant, the Performance Test conducted in accordance with the contract during which the equipment / systems / Plant and the operation thereof comply with all Applicable Laws and the Performance Guarantees and which are established as completed Performance Test in accordance with the provisions of the contract in this behalf herein.

- **"Confidential Information"** shall mean information now or hereafter owned by or otherwise within the possession or control of a Party, including patented and unpatented inventions, business and trade secrets, know-how, techniques, data, specifications, as-built drawings, blue prints, flow sheets, designs, engineering information, Construction information, operation criteria, and other intangible information related to the Project.

- **"Consequential Damages"** shall mean indirect, punitive, special or incidental damages, the loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital and/or financing, down time costs, loss of opportunity, loss of goodwill, and claims of customers for such damages, except the damages provided under the Contract.

- **"Consignee"** shall mean the authorised representative or officer of the Owner to whom the Equipment is required to be delivered in the manner indicated in the Contract and whose identity shall have been notified by the Owner in good and sufficient time having regard to the Contractor's schedule for the delivery of the Equipment.

- **"Consumables"** shall mean all lubricants, lubrication and control oils, greases, filters, jointing & packing materials, hardware, demineralising resins and water treatment chemicals etc. required for operation of the Plant.

- **"Contract Agreement"** shall mean the agreement signed by the Parties to which these General Conditions of Contract, Schedule of Liquidated Damages and other documents and agreements forming part of the Contract are scheduled.

- " **Project Network/ Master Network**" shall mean the Network covering details like:

  design, engineering & manufacturing and procurement schedule for the Equipment identifying all systems and Equipment and milestone dates for manufacture, assembly, inspection/ shop testing, shipment and delivery.

  erection, Commissioning and testing schedule till Take-Over,

  design, engineering, Construction, fabrication schedule for the Project identifying all buildings, structures and milestone dates for various Construction activities.

  Bar chart covering critical and parallel activities indicating period

- "**Contract Period**" shall mean the period from the Commencement Date/ Zero Date till Take Over of the Plant. Provided that the expiry of the Contract Period shall not affect the obligations of the Contractor beyond the Contract Period, as specified under the Contract

- "**Contractor's Works**" or "**Manufacturer's Works**" shall mean the places which are used by the Contractor or any of its sub-vendor/sub-contractor for the manufacture of Equipment for the Plant or performance of Work, designated by Contractor and communicated to the Owner.

- "**Contractor's Equipment**" shall mean all machinery, apparatus, equipment, appliances, materials, items and other things of whatsoever nature required for the execution and completion of the Works, performance of the Contractor's obligations under the contract including Work, establishing of Performance Guarantees, and the remedying of any defects and deficiencies, but does not include Equipment and other things intended to form or forming part of the Plant.

- "**Contractor Permits**" shall mean all those Permits, required by the Contractor from any Government Instrumentality for the performance of any of the obligations of and Work by the Contractor under the Contract, including without limitation, all registrations and licenses required to permit the Contractor to do business in the jurisdiction where it has to perform any part of the work, inclusive of all the Permits, authorizations, consents and approvals required solely for Construction, Commissioning, testing operation of the Plant and transmission of electricity to GETCO.

- "**Contractor's Representative**" shall mean the person named as such in the Contract or other person appointed from time to time by the Contractor in his place in accordance with the Contract, , and such appointment communicated to the Owner,.

- "**Country**" shall mean India, where the works are to be executed and to which Equipment are to be delivered.

- "**CIF Price**" shall mean delivery free of expenses to the Owner on board the

vessel at the port of entry including the insurance and freight charges.

- **"Contract Document"** shall mean and include the General Conditions of Contract, Special Conditions of Contract, Minutes Of Meeting dated [*insert*] between Owner and the Contractor, the Final Proposal of Contractor dated [*insert*] as accepted by the Owner, Specifications, Schedules, Annexures, Drawings, Schedule of Prices and Schedule of Quantities submitted by the Successful Bidder, Letter of Intent, Notice to Proceed issued by the Owner, subsequent amendments to the foregoing in accordance with the terms of the Contract.

- **"Contract Price"** shall mean the agreed sum of money stated in the Contract to be paid to the Contractor for the successful completion of the Works and obligations, in accordance with the terms of the Contract.

- **"Day"** or **"Days"** shall mean a Gregorian calendar day

- **"Defects Liability Certificate"** shall mean the certificate, which the Owner shall issue to the Contractor when the Warranty Period or Extended Defects Correction Period, which ever is later, for the Plant including Equipments has expired, and the Contractor has fulfilled all his obligations under the Contract for such defects.

- **"Directive or Owner's Instructions"** shall mean any requirement, instruction, clarification, direction, order, regulation, code, standard or rule of any Competent Authority, which is legally binding and any modification, extension or replacement issued by the Owner or the Consultant in writing to the Contractor from time to time during the subsistence of the contract.

- **"Documents"** shall mean all design documents, engineering documents, drawings, calculations, computer software (programs), computer diskettes and tapes, audio and video tapes, samples, patterns, models, Construction documents, erection documents, quality plans, inspection reports, field quality plans and test reports, operation and maintenance manuals, and other manuals, and all other data and information to be submitted by the Contractor and shall include without limitation engineering, design and Construction drawings, data sheets, specifications, plans, bills of materials and estimates etc.

- **"Drawings" shall *mean***

  a) Drawing furnished by the Consultant/Owner .

  b) Supplementary drawings if any furnished by the Consultant/ Owner to clarify and to define in greater detail the intent of the Contract.

  c) Drawing submitted by the Contractor with his Final Proposal provided such drawings are acceptable to the Consultant/ Owner.

  d) Drawing furnished by the Consultant/Owner to the Contractor

during the progress of Work.

e) Engineering data and drawings submitted by the Contractor during the progress of Work, provided such engineering data and drawings are acceptable to the Consultant/Owner.

- "**Engineer**" shall mean an officer of the Owner as may be duly appointed and authorised in writing by the Owner for the purpose of the Contract.

- "**Equipment**" **or "Equipments" or "Equipment(s)"** shall mean all of plant, systems, equipments, and Materials specified in Schedule to be supplied under the Contract and such other equipment and materials as may be agreed between the Owner and the Contractor, necessary for incorporation in the Plant.

- "**Extended Defects Correction Period**" shall mean, in relation to any individual item of Work or Equipment comprised in the Works, which has been rectified, repaired, or replaced, twelve (12) months from the date of such rectification, repair or replacement or twenty four (24) months from the date of COD of the Plant whichever is later.

- "**Ex-Works**" shall have the meaning ascribed thereto under Incoterms.

- "**Facility**" or "**Plant**" shall mean the **1x800 MW** supercritical thermal power plant including , all the Equipments, together with all auxiliaries, and related buildings and Civil works of the said power plant to be constructed at Wanakbori, Kheda District, Gujarat, India, as an integrated whole, including without limitation all systems and sub-systems thereof and related facilities, including without limitation any and all appliances, parts, instruments, appurtenances, accessories and other property that may be incorporated or installed in or attached to or otherwise become part of the Plant or as envisaged in the Contract or which otherwise constitutes a part of the Plant and located on Site.

- "**Facility Site**" or "**Site**" shall mean land at Wanakbori, Kheda District, Gujarat, India, owned by Owner on which the Facility will be located, as more particularly identified on the site plan and as described in drawings attached to Contract hereto as Annexure [insert].

- **TAKE OVER CERTIFICATE** shall mean, in relation to the Plant, the certificate issued by the Owner confirming the Owner's Take Over of the Plant as being complete in every respect in accordance with clause No. 20.0 of the General Conditions of Contract, after Provisional Plant Acceptance Certificate is issued and liquidation of the punch lists and pending issues, after completion, synchronization and placed in Commercial operation in accordance with the contract, except for the warranty in respect of Plant/Equipments under the Extended Defects Correction Period, Latent Defects and Warranty for Mandatory Spares.

- "**Final Proposal**" shall mean the document containing the final technical & commercial proposal of Contractor for the Plant as may be modified in accordance with the provisions of the Tender Document, and agreed to in writing by the Owner and shall include but not be limited to technical information, data, documents and drawings forming part thereof, annexed as Annexure [inesrt] to the Contract.

- *"Financial* Closure*"* ***shall mean the date on which the Financing Documents providing for funding by the Lenders have become effective.***

- "**Financing Documents**" shall mean any and all agreement or agreements, notes, bonds, indentures, political risk insurance policies, credit agreements, debt repayment or refinancing instruments, reimbursement agreements, mortgages, security agreements, guarantees, registration statements, disclosure statements, subordination agreements, partnership agreements, lease agreements, participation agreements and other documents relating to the Construction, interim or long-term financing (and any refinancing of the same) of the Project, including any modifications, extensions, renewals or replacements of the same entered into by the Owner for the provision of finance in connection with the Project.

- "**First Synchronisation**" shall mean electrical connection of plant to the Grid by Interconnection of the Facility for the first time after matching of voltage, phase sequence and frequency after satisfactory Commissioning of TG and STG.

- "**Force Majeure**" shall have the meaning setforth in clause 28.0 of these General Conditions of the contract.

- "**Foreign Currency**" shall mean a freely convertible currency such as US $, Japanese Yen, Pound Sterling, Swiss Francs & Euro specified in the Schedule of Prices and Schedule of Delivery in which the Contract Price is payable, but not Indian Rupees.

- **"F.O.B"** shall mean delivery free of cost to the Owner on board the vessel at the port of shipment.

- **"F.O.R. Destination"** shall mean delivery free of expenses to the Owner on board rail wagons at the railway siding at the Site or its nearest railway station including the insurance coverage.

- **"F.O.R. Works"** shall mean loaded and stowed or trimmed free of expenses to the Owner on board rail wagons at the Contractor's Works siding or it's nearest railway station for transportation.

- "**F.O.R. Site**" shall mean delivery free of expenses to the Owner at his Site.

- "**GUVNL**" shall mean Gujarat Urja Vikas Nigam Limited including its successors in title and assigns of its interest.

- "**General Conditions of Contract**" or "**GCC**" shall mean these Conditions of Contract' as amended in accordance with the provisions contained in this behalf herein.