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6.2.3	Interconnecting walkways (minimum 2 m width) between main plant building and boiler (on either side of boiler) at Ground, Mezzanine, Operating, PRDS and Deaerator floor levels shall be provided. Also inter-connecting platform between Boiler and Coal Tripper floor level and roof of Mill maintenance floor level, Feeder floor level, Bunker Building at Mill bay shall be provided. Number of interconnecting platforms between Boiler and Coal Bunker building for each level / floor specified above shall be two (2) on each side of Boiler i.e. four (4)/floor.	
6.2.4	Two of the landing levels of the Goods Elevator shall preferably coincide with the feeder and tripper floor elevations. In case of difference in levels, electric hoists to shift goods from elevator floors to feeder/ tripper floors shall be provided.	
6.2.5	Fuel Oil (F.O.) piping shall be routed over trestles. The headroom for F.O. trestle in Boiler/ESP/ID fan/Chimney area shall be 8.0 M till the road behind chimney and 7.0 M in CD bay area. The headroom for F.O. trestle in outlying area shall be 3.0 M except at rail/road crossing where the headroom shall be 8.0 M.	
6.2.6	Clear walkways along A-row & B-row of TG building shall be provided as indicated below: (a) 1.5 m at all levels of AB Bay. (b) 3.5 m along B-row at operating floor level for interconnection with service Building & in front of control room.	
6.2.7	The layout of the steam turbine unit shall permit sufficient lay down area for all the parts/components to enable carrying out maintenance and overhauling operations.	
6.2.8	Steam turbine and generator (except stator) and other equipments located in the turbine hall shall be accessible by the EOT cranes for their handling during erection and maintenance. For all other equipment/components, suitable handling arrangement for erection and maintenance shall be provided.	

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6.2.9	In TG bay at crane rail level, walkway with handrails is envisaged for entire column sectional depth for full length of the building. In addition, it shall be ensured that on A-row and B-row columns, through walkway (without hindrance) of minimum 600 mm clear width is available from the face of the column to the handrail of the platform.	
6.2.10	Layout of facilities and equipment shall allow removal of Generator Stator, Generator transformers, Station & Unit transformers without disturbing equipments, piping, cabling, duct routed in the area.	
6.2.11	Adequate space and handling arrangement shall be provided for handling/removal of pumps, heaters, heat-exchanger, fans, mills during maintenance.	
6.2.12	Valves shall be located in accessible positions and operating/maintenance platforms shall be provided along with approach ladders & handrails for the same.	
6.2.13	While developing the layout, all fresh air ventilation louvers shall be considered 1000 mm from floor level and directed downwards at an angle. Ventilation fans on AB bay roof shall be kept staggered and shall not be near the centerline of turbo generator set.	
6.2.14	Each equipment room shall be provided with alternate exits in case of fire/accidents as per requirements of factory Act and Statuary bodies/Insurance companies.	
6.2.15	All other safety requirements as per the factories Act, Rules/regulations made under Electricity Act, 2003 and applicable codes/standards shall be observed while developing the layout.	
7.0	<u>OPERATION, MAINTENANCE & AVAILABILITY CONSIDERATIONS</u>	
7.1	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.	

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7.2	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.	
7.3	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. Suitable beams, hooks etc. for this purpose shall be provided in the Buildings.	
7.4	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.	
7.5	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 ever feasible, common components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.	
8.0	<u>MATERIALS</u>	
8.1	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.	
8.2	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.	

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All materials used shall have performed lengthy satisfactory service in similar or more arduous conditions to those proposed by the Contractor.		
8.3	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.	
9.0	<u>LUBRICATION</u>	
9.1	Provision shall be made for suitable efficient lubrication where necessary to ensure smooth operation free from undue wear.	
9.2	Non ferrous capillary tubing shall be used throughout.	
9.3	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.	
9.4	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.	
9.5	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.	
9.6	The Contractor shall supply grease gun equipment suitable to service each type of nipple fitted.	
10.0	<u>LUBRICANTS AND CONTROL FLUIDS</u>	
10.1	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 unit.	

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10.2

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 recognized 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.

10.3

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

11.0

OPERATION AND MAINTENANCE

11.1

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

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

11.2

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

11.3

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.

11.4

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.

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11.5

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.

11.6

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

12.0

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 major equipments like 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 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 units shall also be suitable for two shift operation, if required.

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

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

The allowable stresses shall be so selected so that life expectancy to minimum 2,00,000 hours of operation can be achieved. The Bidder shall

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discuss this aspect in his technical proposal.

13.0 **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 shall be taken into account. Bidder shall consider the details of various wagons normally available with Indian Railways for transportation of heavy equipment. 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 : 3.2 Meters
metres on both sides)
- (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 shall 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

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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 of 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.

Specification of Packaging and Marking has been described in detail in Volume I: General Condition of Contract of the Specification.

14.0 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

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openings shall be closed with 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.		
15.0	<u>PAINTING</u>	
15.1	<u>GENERAL</u>	
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		

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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. 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. The Contractor shall select shop primer for steel and iron surfaces, which will have a continuous operating temperature below 35°C, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35°C. The Owner/Engineer shall submit the colour scheme during execution of contract for approval.		
15.2	<u>PREPARATION</u> 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.	
15.3	<u>DAMAGED PAINTWORK</u> Any damaged paintwork shall be made good as follows:	

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15.3.1	The damaged area, together with an area extending 25 mm around its boundary, shall be cleaned down to bare metal.	
15.3.2	A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage.	
15.3.3	The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming	
15.4	<u>PAINTING SYSTEMS</u>	
	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.	
15.4.1	Surfaces subject to Weathering	
	All surfaces shall have a minimum of four coats of paint made up as follows:	
	(a) Primer coat	: 35 micron DFT
	(b) Tie coat	: 35 micron DFT
	(c) Finishing coat (Two Nos.)	: 35 micron DFT per coat
	(d) The total minimum DFT	: 140 micron
15.4.2	Surfaces Inside Buildings	
	All surfaces shall have a minimum of three coats of paint made up as follows:	
	(a) Primer coat	: 35 micron DFT
	(b) Tie coat	: 35 micron DFT
	(c) Finishing coat (Two Nos.)	: 25 micron DFT per coat
	(d) The total minimum DFT	: 120 micron

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

For detail painting on building & structural steel elements, please refer **Volume VI / A & B** of this specification.

16.0 COLOUR CO-ORDINATION & FINISH

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

16.2 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.

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

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

17.0 ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT

17.1 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 stipulates any other conditions not specified hereunder while clearing the project, same shall be complied with by the Contractor.

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17.1.1 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 17.1.2 For Air Emission (a) Suspended Particulate Matter i.e. dust burden at Chimney outlet - Maximum 50 mg/Nm³ (with worst coal and one field out). (b) NO_x : 365 ppm (maximum) or 750 mg/Nm³ (Equivalent NO₂). (c) SO₂ : As per prevailing Indian/ World Bank standards 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. 17.2 <u>NOISE LEVEL REQUIREMENT</u> The plant shall be designed, constructed and provided with suitable acoustic measures to ensure the noise level criteria as per the following stipulations. 17.2.1 Maximum noise level shall not exceed 85 dB (A) when measured at 1.0 M away from the noise emission source. 17.2.2 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. 17.2.3 Any statutory changes in stipulations regarding noise limitation that may occur in future according to Maharashtra Pollution Control Board or Central Pollution Control Board or Ministry of Environment & Forest regulation		

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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.		
18.0	<u>INSPECTION AND TESTING</u>	
18.1	<u>GENERAL:</u>	
18.1.1	An indicative list of Inspection and testing requirements for each package has been given for equipments across various volumes of this specification. Bidder shall note that these testing and inspections listed herein are the minimum requirements as perceived by the Owner; the bidder shall consider this only as a general guidance and is not meant to be exhaustive. The bidder shall consider requisite testing and inspections across the equipments / systems forming the proposed power plant unit based on his own experience and in line with the current industry practices for identically rated power plant for the technology under consideration. The comprehensive list of tests considered for each of the equipment/ systems shall be furnished as part of the bid.	
18.2	<u>INSPECTION AND TESTS DURING MANUFACTURE</u>	
18.2.1	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.	
18.2.2	The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this Specification.	
18.2.3	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.	
18.2.4	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	

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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 six (6) copies of the Test Certificates. 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. 18.2.5 Under no circumstances any repair or welding of castings shall 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. 18.2.6 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. 18.2.7 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 Owner. The certificates shall include tests for mechanical properties and chemical analysis of representative material. 18.2.8 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		

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hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour. 18.2.9 All necessary non-destructive examinations shall be performed to meet the applicable code requirements. 18.2.10 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. 18.2.11 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 Maharashtra 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. 18.3 <u>PERFORMANCE TESTS AT SITE</u> 18.3.1 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. 18.3.2 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. 18.3.3 The Contractor shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection,		

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pre-commissioning to tests on completion and commissioning of the complete system/equipment.

- 18.4 For details of specific tests required on individual equipment, refer to respective section of this specification.

19.0 TRAINING OF OWNER'S PERSONNEL

The Contractor shall extend all possible assistance and co-operation to the Owner 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 Tender.

19.1 TRAINING AT CONTRACTOR'S PREMISES

The Contractor shall conduct training of Thirty (30) 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 Contract.

The total man-months for training of engineers shall be maximum Thirty (30), having following indicative break-up:

	Discipline	Number of Engineers	Number of Man-month
(a)	Operation	10 heads	10
(b)	Maintenance (Boiler & Turbine)	10 heads	10
(c)	Electrical Maintenance	4 heads	4
(d)	Control & Instrumentation	4 heads	4
(e)	Maintenance Planning	2 heads	2
		30 heads	30

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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 Owner.

The Contractor shall be responsible for the development of the Training Module and Programme Schedule, which shall be submitted to the Owner 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 Owner upon completion of the training. An evaluation shall be jointly undertaken by the Contractor and the Owner'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:

- (a) Coal fired thermal plant principles in management and practice for operators, technicians and maintenance personnel.

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(b) Plant operation and systems training for operators including simulator training as applicable. (c) Maintenance training programme covering electrical, mechanical and instrumentation and control. Said training programme shall be submitted to the Owner 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. 19.2 <u>OPERATION AND MAINTENANCE TRAINING AT SITE</u> 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 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). Instructors shall also be available for Coal handling Plant, Ash Handling Plant, Water Treatment Plant and other specific areas as per requirement.		

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19.3 ON-THE-JOB TRAINING

During the period of pre-commissioning, commissioning and trial operation, the Owner 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 Owner 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.

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LIST OF STANDARDS FOR REFERENCE

ANNEXURE – A

- 1.0 International Standards Organisation (ISO)
- 2.0 International Electro-technical Commission (IEC)
- 3.0 American Society of Mechanical Engineers (ASME)
- 4.0 American National Standards Institute (ANSI)
- 5.0 American Society for Testing and Materials (ASTM)
- 6.0 American Institute of Steel Construction (AISC)
- 7.0 American Welding Society (AWS)
- 8.0 Architecture Institute of Japan (AIJ)
- 9.0 National Fire Protection Association (NFPA)
- 10.0 National Electrical Manufacturer's Association (NEMA)
- 11.0 Japanese Electro-technical Committee (JEC)
- 12.0 Institute of Electrical and Electronics Engineers (IEEE)
- 13.0 Federal Occupational Safety and Health Regulations (OSHA)
- 14.0 Instrument Society of America (ISA)
- 15.0 National Electric Code (NEC)
- 16.0 Heat Exchanger Institute (HEI)
- 17.0 Tubular Exchanger Manufacturer's Association (TEMA)

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18.0	Hydraulic Institute (HIS)	
19.0	International Electro-Technical Commission (IEC) Publications	
20.0	Power Test Code for Steam Turbines (PTC)	
21.0	Applicable German Standards (DIN)	
22.0	Applicable British Standards (BS)	
23.0	Applicable Japanese Standards (JIS)	
24.0	Electric Power Research Institute (EPRI)	
25.0	Standards of Manufacturer's Standardization Society (MSS)	
26.0	Bureau of Indian Standards (BIS)	
27.0	Indian Electricity Rules	
28.0	Indian Boiler Regulations (IBR)	
29.0	Indian Explosives Act	
30.0	Indian Factories Act	
31.0	Tariff Advisory Committee (TAC) rules	
32.0	Emission regulation of Central Pollution Control Board (CPCB)	
33.0	Pollution Control regulations of Dept. of Environment, Govt. of India	
34.0	Central Board of Irrigation and Power (CBIP) Publications	
35.0	The Air Prevention and Control of Pollution Act	
36.0	The Environmental Protection Act	
37.0	The Public Liability Insurance Act	

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38.0 The Forest Conservation Act 39.0 The Wildlife protection Act 40.0 The EIA Notification, 1994 41.0 IS: 14665-Specification for Electric Traction Lift 42.0 Any other statutory Codes/Standards/Regulation		

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<u>BUILDING/ EQUIPMENT LAYOUT REQUIREMENTS</u> <u>ANNEXURE – C</u>		
<u>SR. NO.</u>	<u>ITEM</u>	<u>SPECIFICATION REQUIREMENT</u>
1.0	Minimum clear space required at all working and walking areas for operating & maintenance personnel	
1.1	<u>HORIZONTAL, IN ALL DIRECTIONS</u>	
1.1.1	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
1.1.2	Adjacent to any other plant facilities (including walls / structures)	1000 mm
1.2	<u>VERTICAL</u> (head-room clearance)	
1.2.1	Under any pipe / equipment surface of temperature exceeding 60°C and any electrical cables or other electrical items.	2.0 Metre
1.2.2	Under any other plant facilities (including structures, pipes etc.)	2.0 Metre

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<u>SR. NO.</u>	<u>ITEM</u>	<u>SPECIFICATION REQUIREMENT</u>
1.3	For all areas where any equipment (including trucks, trolleys and other material handling equipment) move or manoeuvre.	Minimum 500 mm clear in all direction from the outer edges of the equipment
1.4	Minimum clear hand space required for	
1.4.1	The application of thermal insulation	100 mm
1.4.2	Welding work	150 mm
1.4.3	Bolt tightening	150 mm
2.0	<u>FLOORS, PLATFORMS, STAIRCASE, LADDERS, WALLS, DOORS & WINDOWS</u>	
2.1	Statutory Requirement	As per the regulations of Tariff Advisory Committee, Indian National Building Code, Indian Factories Act, Local Municipal Rules, etc.
2.2	<u>OPERATION & MAINTENANCE REQUIREMENT</u>	
2.2.1	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

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<u>SR. NO.</u>	<u>ITEM</u>	<u>SPECIFICATION REQUIREMENT</u>
2.2.2	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
2.3	Minimum access opening required (with rolling shutter) transportation,	3.5 M wide x 4 M high or wherever entry of truck, for material depending upon the envisaged equipment size to be handled.
2.4	Plinth level of all buildings, above the local developed for power house building.	300 mm
3.0	<u>OTHER MAINTENANCE REQUIREMENT</u>	
3.1	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

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<u>SR. NO.</u>	<u>ITEM</u>	<u>SPECIFICATION REQUIREMENT</u>
3.2	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, Air Compressors, Blowers, Heat Exchangers, Fuel Oil Pumps, Filters etc.	Shall be possible without disconnecting or dismantling any piping/ducting.
3.3	Overhauling and handling of the casings for the above items	Shall be possible without disturbing / dismantling any piping / ducting not directly connected to them.
3.4	Crane Approach Wherever required, the unobstructed approach of the crane hook / other hoisting equipment hook to various plant & equipment shall be possible.	Yes
4.0	<u>CENTRAL CONTROL ROOM</u> 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

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<u>SR. NO.</u>	<u>ITEM</u>	<u>SPECIFICATION REQUIREMENT</u>
5.0	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.	
5.1	However, as a guide line, following features are given:	
5.1.1	False ceiling and false flooring shall be provided.	
5.1.2	Uniform height, colouring schemes for cabinets etc. shall be available.	
5.1.3	The total area of floor space covered by Control Consoles/Panels in the Control Room shall not exceed 15% of floor area.	
5.1.4	No opening shall be provided from Boiler side.	
5.1.5	Two double leaf doors, suitably located for entering the Control room shall be provided with opening towards the turbine floor.	
5.1.6	Cable entry for the panels/consoles shall be from bottom and suitable openings shall be provided.	

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<u>SR. NO.</u>	<u>ITEM</u>	<u>SPECIFICATION REQUIREMENT</u>	
5.1.7	The Control Room lighting shall be designed to provide a glare free uniform illumination. The level of illumination shall be minimum 400 LUX.		
5.1.8	Necessary Air Conditioning shall be provided for Central Control room, Control Equipment Room and SWAS room etc.		
5.1.9	Basic amenities like toilet, Tiffin rooms, wash basins, rest rooms etc. shall be provided near the Control Room.		
6.0	Toilet and drinking water facility	Required in all buildings and on all floors wherever operating personnel are to be deployed.	

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SPECIFIC LAYOUT CONSIDERATIONS

ANNEXURE-D

While developing the layouts, the following major layout parameters shall be ensured, as a minimum:

<u>SR.NO.</u>	<u>PARAMETER</u>	<u>REQUIREMENTS</u>
1.0	AB bay, BC & CD bay widths	36.0 M, 12.0 M & 12.0M
2.0	Arrangement of TG set	Longitudinal
3.0	Floor levels in AB bay	0.0 M, 9.0 M, 17.0 M
4.0	Floor levels in B-C bay	0.0 M, 9.0 M, 17.0 M 24.0M, 28.0 M 32.8 M, 38.0 M
5.0	Level of operating floor	17.0 M
6.0	Level of mezzanine floor	9.0 M
7.0	HT/LT Switchgear and MCC location	HT Switchgear at 3.5 M and LT Switchgear & MCC at 12.0 M in AB bay
8.0	Area of unloading bays	750 sq. M
9.0	Lay down Area (Minimum on operating floor) with EOT Crane approach	750 sq. M.
10.0	Minimum clear working space around the equipment	1200 mm
11.0	Location of Deaerator	In BC bay at EL. 38.0 M

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<u>SR.NO.</u>	<u>PARAMETER</u>	<u>REQUIREMENTS</u>
12.0	Location of Heaters	HP Heaters/LP Heaters at Operating Floor/ Mezzanine Floor respectively in B-C Bay.
13.0	Location of BFP	TDBFP at Operating Floor and MDBFP at Ground Floor in AB Bay.
14.0	Location of Boiler MCC	At 28.0 M in BC bay
15.0	Clear Head room within Main plant Building for pipes, structures & cable trays, ducts etc.	2.5 M
16.0	Number of Fire Escape staircases in the main plant with fire doors at each landing	Minimum Four (4)
17.0	Minimum width of all staircases landings	1500 mm
18.0	Passenger Elevators	One (min)
19.0	Clear approach width in front and rear of ESP	10 M (Height = 8 M)
20.0	Head Room for pipe/cables trestles at rail, road crossing	8.0 M
21.0	Minimum straight length in Flue gas duct at ESP outlet for Opacity meters.	As required for accurate dust measurement within the battery limits.
22.0	Elevation of ID Ducts entering Chimney	12.75 M (Min.) (Bottom of steel)

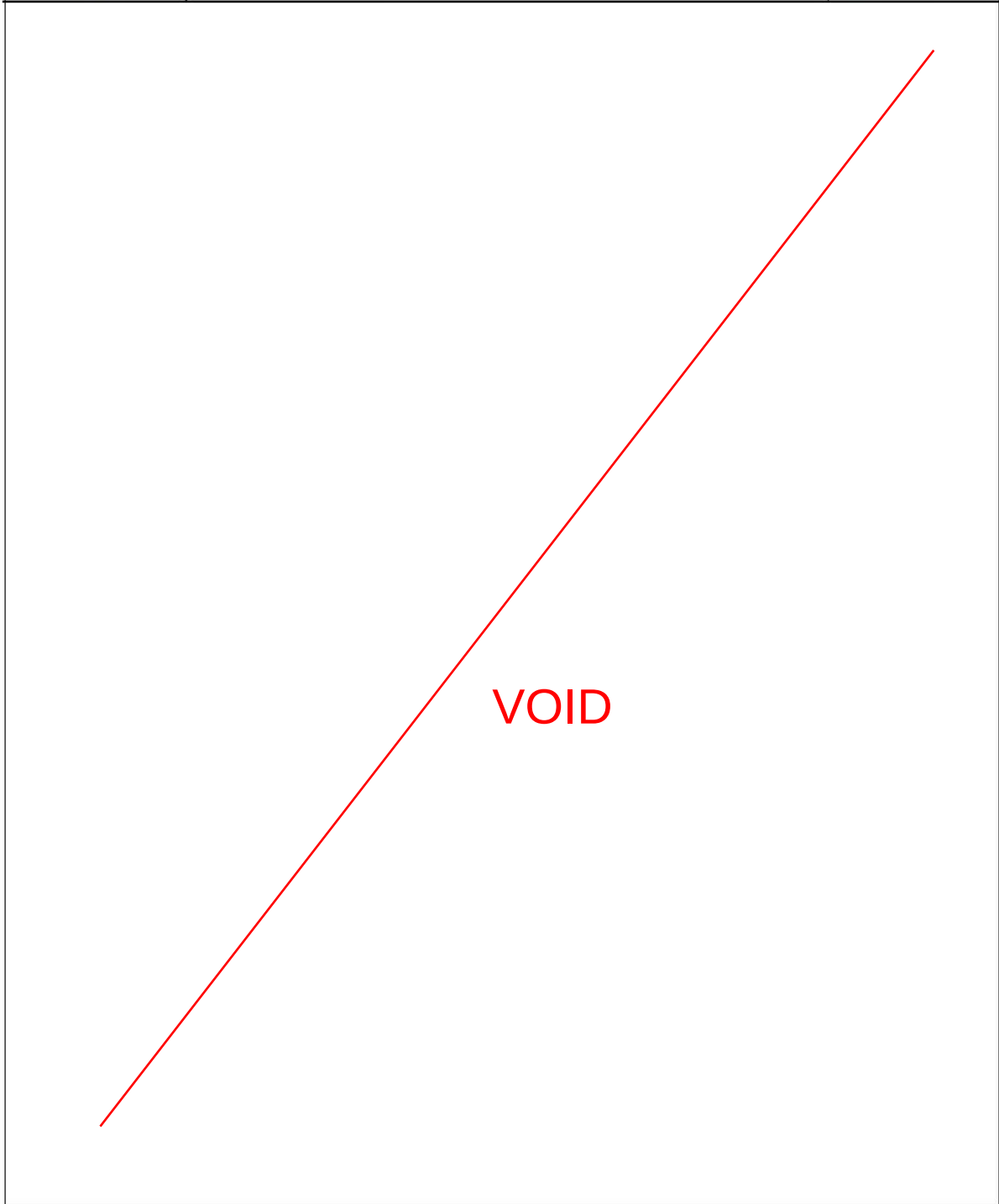
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VOLUME II
SECTION – 5
PROJECT MANAGEMENT AND SITE SERVICES

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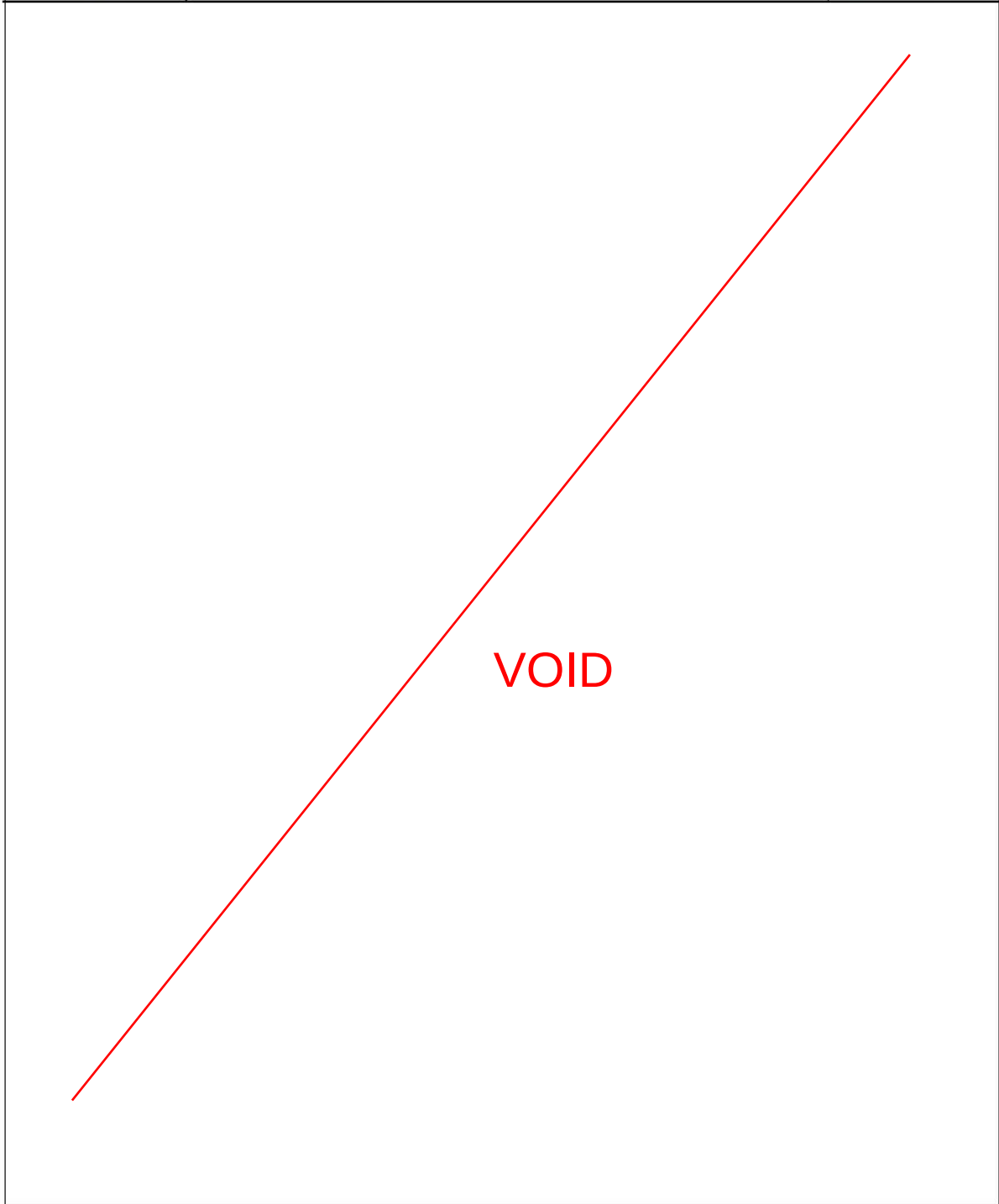
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CONTENT

<u>CLAUSE NO.</u>	<u>DESCRIPTION</u>
1.0	PROJECT MANAGEMENT SERVICES
2.0	SITE SERVICES
3.0	PROTECTION AND CARE

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1.0 PROJECT MANAGEMENT SERVICES

1.1 RESPONSIBILITY

The Bidder shall identify a separate and independent Project Management Team headed by a Project Manager for the execution of this project. Responsibilities of this Project Management Team shall cover the areas listed below:

- (a) Planning and Monitoring
- (b) Engineering Management
- (c) Contracts Management
- (d) Quality Assurance, Inspection & Expediting
- (e) Construction Management
- (f) Spares Management
- (g) Commissioning Management

Detailed responsibilities in the above areas are discussed below:

1.2 ORGANISATION

1.2.1 Headquarters

The headquarters of the Project Management Team shall be headed by a senior level executive designated as the Project Manager who shall be responsible to Owner for the execution of the project. He should have adequate financial power and authority to give decision.

Separately, designated leaders shall be identified for each of the areas mentioned under 1.1, who, in turn, will report to the Project Manager for all matters relative to this contract.

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1.2.2	Central Co-ordination Cell The central coordination cell shall have sufficient technical personnel to coordinate technical matters and to quickly resolve day to day queries or references made by Owner and his Consultants without having the need to refer to his headquarters each time.	
1.2.3	Site Organisation The site should have a competent construction manager for all site operations with adequate financial power and sufficient level of authority to take site decisions. The organisation chart for site should indicate the various levels of experts to be posted for supervision in the various fields in civil construction, erection, commissioning etc.	
1.2.4	Organisation Chart The Bidder shall furnish a detailed organisation chart for the project management team, clearly identifying the key personnel in each of the areas mentioned above. The expected number of executives at different levels shall also be indicated, separately for headquarters, central coordination cell and site organisation.	
1.3	<u>DETAILED RESPONSIBILITIES</u>	
1.3.1	Planning & Monitoring (a) Planning The Bidder shall prepare a Master Network Schedule in the form of PERT network consisting of at least 500 activities. The network shall be prepared on a Work Breakdown Structure for the project which sub-divides the project into a set of manageable systems/sub-systems. The master network will identify milestones of key events for each system/ package in the areas of engineering, procurement, manufacture and despatch and erection and commissioning. The master network shall represent the Level-I plan and will form the basis for development of detailed second and third	

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tier execution plans. The master network shall conform to the overall schedule prescribed by Owner. The master network should be submitted along with the bid which would be mutually discussed and finalised before the Award of Contract. This master network would clearly indicate the responsibility of the Bidder and project management team. This master network would form a part of the contract. The master network shall also identify a complete list of inputs to be furnished by the Owner which may be required for proper interfacing and tie-up. Scheduled dates for providing such inputs shall also be indicated, which will be mutually discussed and finalised. (b) Monitoring & Progress Reporting The progress reports would be emanated every month, one from the head office of the Contractor and another from the site office. The progress report emanating from the head office should necessarily include the following sections: (i) Report on key milestones. (ii) Management summary indicating critical areas with details of actions initiated and effect of any on the project. (iii) Action needing attention of the Owner/Consultant. (iv) Detailed package wise status of engineering submissions, quality plan submissions and approval, procurement manufacture and despatch. The monthly report generated from the site office should necessarily include: (i) Report on key milestones. (ii) Management summary indicating critical areas with details of actions initiated and effect if any on the project.		

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(iii) Action needing attention of the Owner/Consultant.

(iv) This report would also cover the areas pertaining to the receipt of the equipment at the port, port clearance, transport, receipt at site, erection and commissioning.

In addition to the above, as the project execution progresses, the Contractor shall also be responsible for generating more frequent reports in the form of fax/e-mail information on progress in critical areas so that actions can be expedited. The exact format of the progress report shall be finalised after award of Contract.

1.3.2 Engineering Management

Based on the master network for the project (L-1), the Contractor shall prepare an exhaustive list of engineering activities for the equipment/systems covered in his scope and a detailed programme of accomplishing the same within the time frame specified in the master network. This schedule will form the Level-2 (L-2) network for engineering activities.

Based on (L-2) network, the Bidder shall further develop the Level-3 (L-3) network for engineering activities which will indicate schedule for data availability, drawing release date and document submission dates.

Detailed (L-2) and (L-3) networks would be submitted sequentially by the Contractor within two months from the date of issue of Letter of Award and finalised within one (1) month thereafter.

All such networks shall be provided in PRIMAVERA software, supported by back ups (schedule of predecessor/successors as well as floats for activities).

The Engineering Management Team should also co-ordinate all interface engineering activity between the Contractor and the equipment sub-vendors so as to ensure the correctness and completeness of related engineering documentation before the same is submitted to the Owner.

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1.3.3 Contracts Management

Based on the master network, the Contractor shall submit L-2 programmes of manufacture and despatch. In addition, the master network shall also include periods considered for site activities viz. erection, commissioning etc. These L-2 programmes would be submitted in 2 months time from the date of award of contract and finalised within one (1) month thereafter. The Contractor shall also submit site mobilisation plan. This programme would be submitted at the time of finalisation of award of contract and agreed immediately thereafter so that immediate development of the various activities at site could take place.

The Contractor should also submit L-3 programmes for the manufacturing, despatch of the various items. These networks shall also show the Customer Hold Points (CHP) which have to be cleared by Owner or their authorised representative(s) before further manufacture can take place. These L-3 programmes for the manufacture and despatch would clearly identify responsibilities of the Contractor, sub-Contractor and Owner. These networks shall be submitted within one (1) month of the date of finalisation of the various sub-contracts by the Contractor.

In case all the manufacture is being done by the Contractor then the L-2 programmes would be themselves amplified to cover details of the manufacture, inspection, clearance by Owner and despatch.

The Contractor shall also submit the programme for procurement of boughtout items, detailed shipping schedule and cash flow statement for Owner's approval.

1.3.4 Quality Assurance, Inspection and Expediting

The Contractor shall submit the list of manufacturers/sub-vendors from whom the equipment are expected to be procured and the quality assurance plans thereof for the manufacture shall be approved by the QA group of Owner before the manufacture is commenced. The list of major suppliers shall be submitted along with the bid and this shall be mutually discussed and approval will be given by the Owner during contract negotiation meeting prior to placement of Letter of Award. This approved list will be

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binding to the bidder. In the said list, Owner reserves the right to include reputed/reliable vendors of his own choice. Regarding the various other sub-vendors, the list shall be submitted within six (6) months of the award of the contract that shall be scrutinized by the Owner to accord approval. In such list, Owner reserves the right to include vendors of his own choice. No further vendor approval will be given after six (6) months. On the quality plans, the customer hold points will also be identified based on which Owner would give clearance for the manufacture to proceed further. Quality assurance/Inspection group of Owner or its representative would issue a material despatch clearance certificate (MDCC) after the inspection clearance which will enable the Contractor to despatch the equipment and claim the payment. In the despatch programme, the Contractor shall indicate a schedule of estimated programme, tonnages specifically identifying various oversize dimensioned consignments (ODC). Further the Contractor will also be required to ensure at all stages of shipment that packing of all shipments despatched are suitable for ocean freight to India, handling at the port of entry, inland transportation and preservation at site upto erection. All despatch details & item lists shall be made available to both Owner & site immediately after shipping. The Contractor shall also expedite all despatches from their own works/works of their sub-vendors, so as to match with the various activities mentioned at 1.4.3 above. 1.3.5 Construction Management The bidder shall specifically ensure smooth management of site activities with adequate planning keeping in view the quantum of parallel activities as the project picks up. Towards ensuring orderly movement of construction vehicles and unhindered access to all construction fronts, the following activities shall be accorded priority: (a) Completion of all arterial roads in and around the construction fronts. (b) Compound wall for securing site.		

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(c) Requisite drainage (d) All temporary buildings for office and stores. A detailed schedule of the above activities shall be submitted to the Owner within 15 (fifteen) days of the receipt of Letter Of Intent. Based on the L-1 Master Network Programme, within two (2) months of the issue of Letter of Award, the Contractor shall submit a programme of construction / erection / commissioning, either in continuation with the manufacture and despatch or separately for the implementation. These programmes would be amplified showing when the civil drawings shall be released by him and construction of civil works shall be completed by him to facilitate start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring. The three monthly rolling programme with the first month's programme being tentative based on the site conditions would be prepared based on these L-3 programmes. The Contractor shall also be involved along with the Owner to tie up detailed resource mobilisation plan over the period of time of the contract matching with the performance targets. The L-3 programme would be jointly finalised by the site incharge of the Contractor with the Owner's project coordinator as well as the site planning representative. The erection programme shall also identify the sequential erectable tonnages that are required for various equipments which shall be taken care of in the despatch programmes. Erection and commissioning of the equipment shall also be done under the supervision of experts from the respective equipment/ system supplier. 1.3.6 Spares Management Alongwith the proposal for the plant and equipment, the Contractor shall also submit proposals/schedule for the following: (a) Mandatory spares (b) Recommended spares		

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While the award for mandatory spares will be finalised at the time of the award of contract, recommended spares will be finalised within twelve (12) months thereafter. 1.4 <u>PROJECT PROGRESS REVIEW MEETINGS</u> Keeping in mind the overall responsibility of the Contractor, it is intended that periodic progress reviews on the entire activities of execution in respect of Bhusawal Thermal Power Plant will be held initially at least once in two (2) months at Mumbai/site or in the country of the Contractor depending on the circumstances and mutual agreement. During peak period, it may be held once in a month. These meetings will be attended by reasonably higher officials of the Contractor and their leading sub- contractors and will be used as a forum for discussing all areas where progress needs to be speeded up. Actions will be placed on the concerned agencies and decisions will be taken to expedite/speed up the progress. Minutes of such meetings will be issued reflecting the major discussions and decisions taken and circulated to all concerned for reference and action. The Contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings. In addition to the above, and to streamline the construction and erection at site, a suitable frequency and forum of periodic meetings between the Contractor and the Owner will be decided upon as part of erection coordination procedure. Site co-ordination meeting may be held on weekly basis. 1.5 <u>OWNER'S CONSULTANT</u> The Owner would appoint a Consultant to assist him in some of the areas mentioned above. The details of interaction and procedures for coordination between Owner/ Owner's Consultant and Contractor/Contractor's Project Management Team shall be finalised during contract negotiations. 1.6 <u>COMMISSIONING MANAGEMENT</u> 1.6.1 For commissioning of the various equipment/system covered under the scope of contract, Owner shall form an organisation structure which may		

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consist of the following committees. The Contractor shall nominate his representative on one or more of the committees as decided by the Owner: (a) Steering Committee (b) Commissioning Panel (c) Working Parties (d) Testing Teams 1.6.2 Commissioning documents shall be prepared by the Contractor in the following manner and submitted for Owner's approval: (a) Field Quality Plan This document shall be prepared for the various equipment/ systems under commissioning and shall have the following objectives to fulfill and shall be submitted for Owner's approval at least six (6) months before their actual commissioning: (i) Establish design data against which Plant Performance will be compared. (ii) Set-out the testing objectives and proposals. (iii) Define the documentation required. (b) Testing/Commissioning Schedule: These shall be prepared for the various equipment/systems under consideration and shall contain sections like detailed testing method, programme, safety, individual responsibility and results. (c) Standard Check Lists Standard check lists are intended for use at the completion of erection to ensure correct erection, testing and to a limited extent operation for repetitive items.		

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1.6.3 Test Reports

After the completion of commissioning activity of equipment / systems, the Contractor shall prepare the test reports which shall include all the relevant information related to various commissioning checks, tests carried out, any deviations/commissions noticed with respect to the intended design requirements, sequence of various commissioning activities as actually adopted vis-a-vis as recommended in the procedures, programme schedules achieved and any other such information as required. These test reports shall be submitted in requisite number of copies to the Owner and this should be duly signed jointly by the Owner/Consultant and the Contractor/Equipment supplier, who are involved during the commissioning activities.

SITE SERVICES

These services shall be rendered by the Bidder as part of the overall project management service. The services shall broadly include but not be limited to the following:

- 1.7 Arranging material despatch from the shop by rail/road and/or sea as applicable.
- 1.8 Monitoring movement of materials & follow-up as necessary with Railways, road transport, port clearance etc from the time of despatch F.O.R. works/F.O.B. port of shipment by Contractor till receipt of the same at site.
- 1.9 Unloading of materials at Railway Station/Railway Siding inside project area, transportation to site store, assessment of lost/damaged items in transit and arranging insurance claims and replacement of lost/damaged items. The Contractor shall submit to the Engineer a report detailing all the receipts during the week.
- 1.10 Issuing materials from site store/open yard from time to time for erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the plant is officially taken over by the Owner after complete erection and successful trial run & commissioning.

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1.11	Transportation of materials to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.	
1.12	Trial run and commissioning of individual equipment/sub-systems and the plant as a whole to the satisfaction of the Owner, including supply of temporary equipment & services for chemical cleaning, steam blowing as well as performance guarantee tests. Apart from Boiler, proper chemical cleaning shall be carried out in following pipe lines/equipment before commissioning (a) Deaerator (b) Boiler feed suction, recirculation leak-off lines (c) Boiler Feed discharge line by passing heaters (d) Attenuation lines (e) Condensate suction & discharge piping upto de-aerator by passing the feed water heaters. (f) Fuel oil lines. Provision for preservation of individual equipment after trial run and commissioning e.g. Nitrogen blanketing etc as necessary shall also be in the scope of the Bidder. Safe disposal of effluent after chemical cleaning shall be done by the Contractor.	
1.13	Supply and application of the final paints and first fill lubricants on all the equipment to be erected under this specification. Supply of LDO, chemicals, lubricating oils upto COD.	
1.14	For the purpose of erection and commissioning, the Contractor's scope of work shall include but not be limited to the following :	
1.14.1	Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to be rendered under this specification.	

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1.14.2	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under the scope of this specification.	
1.14.3	Supply of commissioning spares.	
1.14.4	Supply of all consumables, e.g. welding electrodes, cleaning agents, diesel oil, grease, lubricant etc. as well as materials required for temporary supports, scaffolding etc. as necessary for such erection work except those listed under exclusion elsewhere in this specification.	
1.14.5	Construction of all civil / structural / architectural works, including construction of foundation for all equipment supplied as required, grouting of equipment on foundation after alignment, and all other incidental civil activities as detailed elsewhere.	
1.14.6	All structural steel fabrication and erection work as detailed elsewhere in the specification.	
1.14.7	Providing support services for the Contractor's erection staff e.g. construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, insurance cover, watch & ward for security and safety of the materials under the Contractor's custody etc. as required.	
1.14.8	Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with the Owner; submitting monthly progress reports as also any such document as and when desired by the Owner; taking approval of all statutory authorities e.g. Boiler Inspector, Factory Inspector, Inspector of Explosives etc. for respective portions of work under the jurisdiction of such statutes or laws.	
1.14.9	The Contractor shall provide 'Industrial Relations' unit and 'Medical' unit to take care of his erection staff and the Owner shall have no obligation in the regard.	
1.14.10	The successful Bidder shall arrange for Tower cranes (400 Tonnes capacity) as per requirement for speedy erection activities.	

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1.15 SITE ORGANISATION

The Contractor shall maintain a site organisation of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organisation shall be reinforced from time to time, as required, to make up for slippages from the schedule without any commercial implication to the Owner. The site organisation shall be headed by a competent construction manager having sufficient authority to take decisions at site.

On award of contract, the Contractor shall submit to the Owner a site organisation chart indicating the various levels of experts to be deployed on the job. The Owner reserves the right to reject or approve the list of personnel proposed by the Contractor. The persons, whose bio-data have been approved by the Owner, will have to be posted at site and deviations in this regard will not generally be permitted.

The Contractor shall also submit to the Owner for approval a list of construction equipment, erection tools, tackle etc. prior to commencement of site activities. These tools & tackle shall not be removed from site without written permission of the Owner.

1.16 GENERAL GUIDELINES FOR FIELD ACTIVITIES

1.16.1 The Contractor shall execute the works in a professional manner so as to achieve the target schedule without any sacrifice on quality and maintaining highest standards of safety and cleanliness.

1.16.2 The Contractor shall co-operate with the Owner and other Contractors working in site and arrange to perform his work in a manner so as to minimise interference with other Contractors' works. The Owner's engineer shall be notified promptly of any defect in other Contractor's works that could affect the Contractor's work. If rescheduling of Contractor's work is requested by the Owner's engineer in the interest of overall site activities, the same shall be complied with by the Contractor. In all cases of controversy, the decision of the Owner shall be final and binding on the Contractor without any commercial implication.

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1.16.3	The Engineer shall hold weekly meetings of all the Contractors working at Site at a time and a place to be designated by the Engineer. The Contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the Engineer and shall strictly adhere to those decisions in performing his Work. In addition to the above weekly meeting, Engineer may call for other meetings either with individual Contractors or with selected number of Contractors and in such a case the Contractor, if called will also attend such meetings.	
1.16.4	The Engineer shall however not be responsible for provision of additional labour and or materials or supply or any other services to the Contractor except for the co-ordination work between various Contractors as set out earlier.	
1.16.5	The works under execution shall be open to inspection & supervision by the Owner's engineer at all times. The Contractor shall give reasonable notice to the Owner before covering up or otherwise placing beyond the reach of inspection any work in order that same may be verified, if so desired by the Owner.	
1.16.6	Every effort shall be made to maintain the highest quality of workmanship by stringent supervision and inspection at every stage of execution. Manufacturer's instruction manual and guidelines on sequence of erection and precautions shall be strictly followed. Should any error or ambiguity be discovered in such documents, the same shall be brought to the notice of the Owner's engineer. Manufacturer's interpretation in such cases shall be binding on the Contractor.	
1.16.7	The Contractor shall comply with all the rules and regulations of the local authorities, all statutory laws including Minimum Wages, Workmen Compensation etc. All registration and statutory inspection fees, if any, in respect of the work executed by the Contractor shall be to his account.	
1.16.8	All the works such as cleaning, checking, leveling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipments for checking and cleaning, surface preparation, edge preparation, fabrication of tubes and pipes as per general engineering practice at site, cutting grinding, straightening, chamfering, filling, chipping, drilling, reaming, scrapping, shaping, fitting-up bolting/welding, etc., as	

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