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)

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

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

CONSULTANT : PROCON ENGINEERS

CRITERIA FOR LAYOUT

ANNEXURE – B

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
1.0	**SITE CONDITIONS TO BE CONSIDERED**	
1.1	Prevalent wind direction during summer (for deciding cooling tower orientation)	See wind-rose in plot plan.
1.2	Prevalent wind direction (s) during dry seasons (for deciding the location of coal stock pile and ash dump/ unloading areas, minimising the pollution effect due to dust)	See wind-rose in plot plan.
1.3	Location of	
1.3.1	Raw Water intake point	As shown in Plot Plan
1.3.2	Plant drainage outfall point (s)	In Existing Drainage/Effluent treatment Plant
1.3.3	Railway entries & exits	As shown in Plot Plan
1.3.4	Road entries & exits	As shown in Plot Plan
1.3.5	Electrical power transmission grid system	As shown in Plot Plan
1.3.6	Preferred / selected ash dump area	Velhala nearly 10 Km from the site
1.3.7	Nearest residential area	Existing Colony

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
2.0	**LAYOUT REQUIREMENTS**	
2.1	MAXIMUM PERMISSIBLE SLOPE IN	
2.1.1	Rail track	1 in 400
2.1.2	Road	1 in 30
2.1.3	Sides of unpaved embankment	1 in 2
2.2	REQUIRED ROAD WIDTH	
2.2.1	Main roads	14.00 Metres with 1.0 m wide shoulders on either side for outer roads on western and eastern side and 7 meters with 1.5 m wide shoulders for other two sides of power block.
2.2.2	Auxiliary interconnections	Minimum 4 Metres without shoulders on either side and shall vary upto 7 m subject to availability of space. For carriage way, 5 Metre wide with 0.5 Metre shoulders and 7.0 Mtre wide with 1.5 Metre shoulders.
2.2.3	Road to the power house unloading bay	
(a)	Only for entry to the unloading bay	Yes
(b)	To pass through the unloading bay	No

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
2.3	Required minimum horizontal distance between the nearest points of	
2.3.1	Plant boundary and the boundary of residential area	(Local municipality/factory rule)
2.3.2	Electrical transformer and any other	As per the Tariff Advisory Committee Rules
2.3.3	Fire water supply installation and any building / facility subject to fire risk.	As per the Tariff Advisory Committee Rules
2.3.4	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
2.4	Required minimum vertical clearance	
2.4.1	Under pipes/cable racks at road crossings	8.0 Metres
2.4.2	Soil coverage over underground pipes	1.0 Metre (minimum)
2.4.3	Pipe/Cable trench	Not Acceptable
2.5	Railway Wagon clearance	Rules of the Indian Railways
2.6	Minimum Clearance between any road edge and building/ structure / any fixed installation	3 Metres
2.7	Required level, above the local developed grade level, of	

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
2.7.1	Top of all roads	150 mm
2.7.2	All outdoor paved areas	150 mm
2.8	Temporary storage areas, workshops, offices, residence etc. required at the time of erection work.	Yes
2.9	Green belt around power plant area	As per environmental guidelines of MOEF, Govt. of India.

CONSULTANT : PROCON ENGINEERS

BUILDING/ EQUIPMENT LAYOUT REQUIREMENTS

ANNEXURE – C

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
1.0	Minimum clear space required at all working and walking areas for operating & maintenance personnel	
1.1	HORIZONTAL, IN ALL DIRECTIONS	
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	VERTICAL (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

CONSULTANT : PROCON ENGINEERS

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
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	**FLOORS, PLATFORMS, STAIRCASE, LADDERS, WALLS, DOORS & WINDOWS**	
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	OPERATION & MAINTENANCE REQUIREMENT	
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

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
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	**OTHER MAINTENANCE REQUIREMENT**	
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

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
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	**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

CONSULTANT : PROCON ENGINEERS

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
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.	

SR. NO.	ITEM	SPECIFICATION REQUIREMENT
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.

SPECIFIC LAYOUT CONSIDERATIONS

ANNEXURE-D

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

SR.NO.	PARAMETER	REQUIREMENTS
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

SR.NO.	PARAMETER	REQUIREMENTS
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)

VOLUME II

SECTION – 5

PROJECT MANAGEMENT AND SITE SERVICES

CONSULTANT : PROCON ENGINEERS

CONTENT

CLAUSE NO.	DESCRIPTION
1.0	PROJECT MANAGEMENT SERVICES
2.0	SITE SERVICES
3.0	PROTECTION AND CARE

CONSULTANT : PROCON ENGINEERS

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.

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 DETAILED RESPONSIBILITIES

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

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.

(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.

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

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.

(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

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 PROJECT PROGRESS REVIEW MEETINGS

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 OWNER'S CONSULTANT

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 COMMISSIONING MANAGEMENT

1.6.1 For commissioning of the various equipment/system covered under the scope of contract, Owner shall form an organisation structure which may

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.

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.

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) Attemperation 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.

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.

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.

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

may be applicable in such erection and are necessary to complete the work satisfactorily, are to be treated as incidental and the same shall be carried out by the Contractor as part of the work.

1.16.9 In case of any class of work for which there is no such specification as laid down in the contract such as blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with the instructions and requirements of the Engineer.

1.16.10 It may sometimes be necessary to remove some of the erected structural members to facilitate erection of bigger/pre-assembled equipment. In such cases, removal and re-erection of such members, which are essential, and if so agreed by the Engineer, will have to be done by the Contractor.

1.16.11 Attachment welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., both for regular measurement and performance testing to be provided on equipment, its auxiliaries or pipelines covered within the scope of this tender, will also be the responsibility of the Contractor and the same will be done as per the instructions of Engineer. The erection and welding of all above items will be the Contractor's responsibility, even if :

(a) Product groups under which these items are re-leased are not covered in the scope of this tender.

(b) Items are supplied by an agency other than the Contractor.

1.16.12 Preservation of all materials / equipment under custody of the Contractor during storage, pre-assembly & erection, commissioning etc shall be the responsibility of the Contractor. All necessary preservatives and consumables like paints etc shall be arranged by the Contractor. Necessary touch up painting, periodic application of preservatives/ paints on pressure parts/other equipment even after erection until completion of work shall be carried out by the Contractor. The Contractor shall fabricate piping, install lub oil systems and carry out the acid cleaning of fabricated piping. The Contractor shall also service the lub oil system, carry out the hydraulic test of oil coolers etc.

1.16.13 It is responsibility of the Contractor to do the alignment etc if necessary, repeatedly to satisfy Engineer, with all the necessary tools & tackles, manpower etc. The alignment will be complete only when jointly certified so, by the Contractor's Engineer & Owner. Also, the Contractor should ensure that the alignment is not disturbed afterwards.

1.16.14 Additional platforms for approaching different equipment as per site requirement, which may not be indicated in drawings, shall be fabricated and erected by the Contractor. The materials required for these works shall be supplied by the Contractor and he will have to fabricate them to suit the requirement.

1.16.15 Equipment and material which are wrongly installed shall be removed and reinstalled to comply with the design requirement at the Contractor's expense, to the satisfaction of the Owner/ Consultant.

1.16.16 Before erection of any equipment on a foundation, the Contractor shall check and undertake if necessary rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc

1.16.17 Assistance for calibrating/testing the power cylinders, valves, gauges, instruments, etc., and setting of actuators coming under various groups shall be provided by Contractor.

1.16.18 It shall be the responsibility of the Contractor to provide ladders on columns for initial works till such time stairways are completed. For this, the ladder should not be welded on the column and should be prefabricated clamping type. No temporary welding on any structural member is permitted except under special circumstances with the approval of Owner.

1.16.19 Structural materials required for the supporting/operating platforms required for the valves at various levels for the same operation of valves will be arranged by the Contractor.

1.16.20 For civil, structural and architectural works, **Volume VI-A/B** may be referred. For Electrical and Instrumentation works, **Volume IV-A/B and Volume V** may be referred.

1.17 SAFETY

Safety and overall cleanliness of work site shall be given top priority.

1.17.1 The Contractor shall ensure the safety of all workmen, materials and equipment either belonging to him or to others working at site. He shall observe safety rules & codes applied by the Owner at site without exception.

1.17.2 The Contractor shall notify the Owner of his intention to bring to site any equipment or material which may create hazard. The Owner shall have the right to prescribe the conditions under which such equipment or material may be handled and the Contractor shall adhere to such instructions. The Owner may prohibit the use of any construction machinery, which according to him is unsafe. No claim for compensation due to such prohibition will be entertained by the Owner.

1.17.3 Storage of petroleum products & explosives for construction work shall be as per rules and regulation laid down in Petroleum Act, Explosive Act and Petroleum and Carbide of Calcium Manual. Approvals as necessary from Chief Inspector of Explosives or other statutory authorities shall be the responsibility of the Contractor.

1.17.4 The Contractor shall be responsible for safe storage of his and his sub-contractor's radioactive sources.

1.17.5 All requisite tests & inspection of handling equipment, lifting tools & tackle shall be periodically done by the Contractor. Defective equipment shall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.

1.17.6 All combustible waste and rubbish shall be collected and removed from the worksite at least once in a day. Use of undercoated canvas paper, corrugated paper, and fabricated carton, plastic or other flammable materials shall be restricted to the minimum and promptly removed.

1.17.7 The Contractor shall provide adequate number of fire protection equipment of the required types for his stores, office, temporary structures, labour

colony etc. Personnel trained for fire-fighting shall be made available by the Contractor at site during the entire period of the Contract.

1.17.8 All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The Contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installation.

1.17.9 All workmen of the Contractor working in construction site shall wear safety helmets, safety boots and safety belts. The Contractor shall take appropriate insurance cover against accidents for his workmen as well as third party.

1.17.10 All the worksites shall be provided with adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. by the Contractor for proper working environment during night times.

1.17.11 All safety precautions shall be taken for welding and cutting operations as per IS-818.

1.17.12 All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.

1.18 TAKING DELIVERY & STORAGE

1.18.1 The Contractor shall arrange issue of all equipment and materials to be erected under the contract from the stores/open yard at site by signing on standard indent forms. After completion of work, detailed auditing of the materials so issued shall be submitted to the Owner.

1.18.2 The Contractor shall arrange for proper and safe storage of materials till the same are taken over by the Owner as per terms of the contract. Manufacturer's instructions for preservation shall be strictly followed.

1.18.3 All empty containers, packing materials, gunny bags, transport frames and also surplus and unused materials reconciliation prior to completion of contract shall be the property of the Owner and returned to the Owner by the Contractor.

1.19 SITE WELDING & HEAT TREATMENT

1.19.1 Welding shall be done in accordance with IS-813, IS-816, IS-9595 & other relevant IS/ International standards and as per instructions of Contractor. Only those welders, who are qualified as per IS-817 for ordinary welds and as per IBR/ASME Section-IX for high pressure welds, shall be employed in the job.

1.19.2 All welders shall be tested and approved by Engineer before they are actually engaged on the work even though they may possess the requisite certificates. The Owner reserves the right to reject any welder without assigning any reason. The welder identification code as approved by the Engineer shall be stamped by the welder on each joint done by them. The Contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by Owner.

1.19.3 The Engineer is entitled to stop Contractor's any welder from his work if his work is unsatisfactory for any technical reason or there is a high percentage of the rejection of joints welded by him, which in the opinion of Engineer will adversely affect the quality of welding even though the welder has earlier passed the tests. The welders having passed the tests do not relieve the Contractor from his contractual obligations, to check the performance of the welders.

1.19.4 All charges for testing of welders including destructive and non- destructive tests if conducted by Owner or by the inspection authority at site shall have to be borne by the Contractor. The necessary test materials and consumables will have to be arranged by the Contractor and all testing facility made available, as required.

1.19.5 All welded joints shall be subject to acceptance by Engineer. Inspection of welds shall be in accordance with IS-822 or equivalent code.

1.19.6 Preheating/postheating and stress relieving after welding are part of fabrication and erection work and shall be performed by the Contractor in accordance with the instruction of Engineer. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the Contractor shall have to arrange for the labour, heating elements,