TELANGANA STATE POWER GENERATION CORPORATION LTD.

4 X 270MW BHADRADRI TPS

AT
MANUGURU, KHAMMAM, TS

VOLUME IIB & III

TECHNICAL SPECIFICATION
FOR
ELEVATOR

SPECIFICATION NO.: PE-TS-411-502-A001

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, U.P
INDIA

INDEX
VOLUME – IIB

SECTION - A

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY / INTENT OF SPECIFICATION

1.1 This specification includes, but not limited to design, engineering, material selection, manufacturing and assembly, inspection, testing at manufacturer's works, packing, forwarding and transportation to site, unloading, storage & handling at site, erection & commissioning, carrying out trial run and acceptance / functional guarantee test at site & final painting of passenger elevator for ***4X270 MW BHADRADRI TPS at MANUGURU KHAMMAM district, TELANGANA STATE*** and necessary accessories including supply of, erection and commissioning spares, special maintenance tools and tackles etc.

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the responsibility of providing such facilities to complete the supply, erection and commissioning of the **Elevators** and its accessories.

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.

1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification**.** In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.

1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or customer including their consultant as interpreted by BHEL in the relevant context.

1.11 The standard quality plan is included in this specification to enable the bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the quality plan as minimum requirement during manufacturing and testing.

1.12 Site Visit before submission of offer.

Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details wrt existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.

1.13 Compliance cum confirmation certificate is to be accepted by bidder without any modification.

1.14 Other requirements

Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor’s account and shall not be used as a reason for extension in contract completion.

SECTION - B

PROJECT INFORMATION

PROJECT INFORMATION

INTRODUCTION

4x270 MW Bhadradri TPS is being set up by Telangana State Electricity Corporation Limited (TSGENCO) at Manuguru in the district of Khammam, Telangana, India.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

APPROACH TO SITE

The distance from Manuguru to Major cities in state:

City	Km
Hyderabad	345
Warangal	180
Bhadrachalam	38
Kothagudem	70
Khammam	130
Vijayawada	195

District : KHAMMAM

State : TELANGANA

Nearest Airport: The nearest airport is Vijayawada Airport but the most used airport is the Hyderabad International Airport.

Nearest Railway Station: Manuguru railway station is 10KM from nearby town. However Warangal/Vijaywada railway Station is major railway station near to Manuguru.

1. Owner : TSGENCO
2. Project Title : 4X270 MW Bhadradri TPS
3. Location : 16 Km from Manuguru Railway station
4. Nearest Railway Stn. : Manuguru
5. Temperature
   a. Mean daily minimum ambient temperature during oldest month of the year: 11.5 Deg.C
   b. Mean daily minimum ambient temperature during hottest month of the year: 45.1 Deg.C
6. Rainfall: Intensity of rainfall @ 50 mm/hr considering heaviest fall in 24 hrs
7. Wind Data: Basic wind speed at 10m height : 44 m/sec
8. Wind pressure As per IS: 875 Part III- 1987
9. Seismic Zone: Zone III as defined in IS:1893 (part-1)-2002 according to Indian Standard Seismic Zoning Map

10	**Power Supply : The power supplies for distribution and auxiliaries shall be as under:**	
	a) In plant generation	16.5kV ±5% , 3ph, 50Hz ±5%, high resistance earthed.
	b) MV distribution	6.6kV ±6 %, 3ph, 3w , 50 Hz, + 5 % to – 5%, Non-effectively earthed
	c) LT distribution	415V ±10%, 3ph, 4W, 50Hz + 5% to –5%, Effectively earthed
	d) Motor rated above 160kW	6.6kV ±6 %, 3 ph 50Hz +5% to -5%.
	e) Motor rated 160kW and below all motorized actuators.	415V ±10%, 3 ph, 50Hz +5% to -5%.
	f) For motors equal and below 30kW winding heating	24V AC ±10, 50 Hz %, [to be generated in 415V switchgear by vendor]
	g) DC Motors	220V DC + 10% to - 15%, 2 wire ungrounded system
	h) Control supply for relay panel/ 6.6kV breakers/415V breakers and DC emergency lighting.	220V DC + 10% to - 15%, 2 wire ungrounded system
	i) UPS for instrumentation & Control system	240V AC ±1 %, 1 ph ,50Hz ±0.5% 2 Wire AC system
	j) Control supply for 415V Motor contactors/AC Control circuits [to be generated in MCC /panel by vendor]	110V AC ±10%, 50Hz + 5% to –5%.
	k) Diesel Generator emergency supply	415V ±10%, 3ph,3W, 50Hz +5%to –5%.
11	**Fault levels**	
	a) 400kV	40kA rms for 1 sec
	b) 6.6kV	40 kA rms for 1 sec.
	c) 415V	50 kA rms for 1 sec.
	d) DC Supply	25 kA

SECTION – C
SPECIFIC TECHNICAL REQUIREMENTS

SECTION C1-A

SCOPE OF SUPPLY & SERVICES, EXCLUSION AND TERMINAL POINTS.

1.0 Introduction

Passenger elevator shall be provided for access to various operating floors / platforms in TG building, administrative building and Service building for 4X270 MW BHADRADRI TPS to facilitate movement of operating and maintenance personnel.

2.0 Scope of equipment supply and services

2.0.1 Design, Engineering, Manufacture, Inspection & Testing at manufacturer's works or at their sub-vendor's works, Painting at manufacturer's or at their sub-vendor's works, duly packed for transportation to site, delivery to site, storage and handling at site, Erection & Commissioning, carrying out trial run and Acceptance / functional tests at site & final painting of Passenger Elevators for 4 X 270 MW BHADRADRI TPP as listed below:-

Sl. no	Building	No. of elevators	Capacity	No. of landings	Total rise	Type	Speed
1	TG building	3 No.	884 Kg	Four including ground (0.0m, 9.0m, 15.5m, & 21.0m)	21.0 M	Conventional (passenger elevator)	1.0 M/s
2	Service Building	1 Nos.	884 Kg	Six including ground (0.0m, 4.25m, 8.5m, 12.75m, 17.0m & 21.25m,)	21.25 M	Conventional (passenger elevator)	1.0 M/s
3	**Administrative Building (**)**	1 Nos.	884 Kg	Three including ground (0.0m, 4.25m, 8.5)	8.5 M	Conventional (passenger elevator)	1.0 M/s

(**) Traction machine including motor, car /cwt buffers, ARD, Control panel, Cwt and all safety related components shall be selected/designed considering G+3 (Four including ground) floor requirement approximate height 13 m.

2.0.2 Elevator shall include but shall not be limited to the following:-

1) Elevator car with SS 304, 1.5 mm (min) thick sheet of hair line finish.

2) Guide rails for car and counterweights.

3) Counterweight.

4) DCEM brakes.

5) Spring buffer for car and counterweight.

6) Driving arrangement including motor, gear box, sheaves etc.

7) All electrical equipment including power cable, control cable, controller panel, safety devices including push buttons, limit switches, safety switches, indicators etc.

8) Isolating switch / MCBs.

9) Car doors, car ceiling and hoist way doors of SS 304, 1.5 MM (min) thick sheet of hair line finish.

10) Car operating panel, digital control, car position indicator at all floors, luminous hall buttons, auto door operating mechanism, alarm bell, car light & car fan.

11) Intercom connection through EPABX or PA which shall be finalized during contract stage.

12) Ropes for hoisting.

13) Circuit breaker, switch fuse unit etc. in machine room for terminating the power supply cable (power supply cable provided by purchaser up to machine room level), other power/control and trailing cabling and equipment earthling.

14) Ladder in pits.

15) Emergency light with rechargeable battery.

16) All fixing materials require fixing rails, brackets, equipment including nuts and bolts.

17) Fascia plates (750 mm minimum) & sill angels.

18) Full length infra-red Curtain safety feature in door along with pressure limiter as an extra mechanical safety.

19) ELCB if required as per statutory requirement.

20) Any other equipment required to meet the requirement of local statuary and regulatory body and prevailing lift etc.

21) Car lighting, recessed fluorescent light fittings for illumination level of 100 lux on car floor.

22) Elevator shaft, pit cable conduit fixtures, switches 3 pin or as required by bidder during erection / maintenance purpose at every 3 m.

23) Mirror for the car rear panel.

24) Floor announcement cum music system to be provided.

25) Special maintenance tools and tackles along with un-priced list with the offer.

26) Recommended spares for three (3) years of trouble operation. Bidder to furnish un-priced list along with the offer.

27) Three (3) sided SS- mirror finish hand railing at suitable height.

28) Minor civil work including grouting as well as foundation bolt grouting as required during installation of elevator.

29) Scaffolding for erection.

30) Automatic rescue device with battery drive - Modern advanced electronic drive system of rescuing passenger trapped in an elevator shall be provided.

31) Emergency safety devices - The lift shall be provided with safety device attached to the lift car frame and sustaining the lift car up at governor tripping speed with full rated load in car.

32) All steel embedment for fixing landing doors / indicators etc. to the elevator well shaft and fascia plate shall be supplied by the bidder

33) Guide rails complete with supporting brackets for the car and counter weights.

34) Elevator drive machines complete with electric motor, reduction gear unit, suspension ropes, buffers for the cars and the counter weights and other drives and control mechanism. All foundation anchor bolts, sleeves, anchoring steels and any item required to complete the job satisfactorily shall be provided by the bidder. The bidder shall also provide for the grouting of anchor bolts, sleeves, anchoring steel etc. and other anchorages.

35) Any other steel works as well as all other accessories / components not specified in the technical specification but necessary for making the elevator complete.

36) All minor building works including the supply of steel items, associated with installations of equipments in the machine room hoist way, hoist way door, frames and elevator pit, shall form part of bidder's scope of supply, BHEL / customer will provide the elevator well complete with foundation and brick walls around the lift well together with overhead machine room. The machine room will be provided with RCC floor slab with necessary pockets for anchor bolts and slots.

37) Dummy landing/s, as required in case travel between two consecutive landings is more than 10 m, shall be considered by bidder in his offer.

38) Any other requirement stipulated by state statuary body and prevailing local lift act requirement shall also to be included by bidder in their scope.

39) Bidder shall use latest IS 14665 (all parts) for outline dimensions of elevator & shaft, installation, operation, maintenance & inspection and testing and for elevator components design.

NOTES:

1) Flooring for all elevators shall be vitrified ceramic tiles of mat finish as indicated in the Data sheet.

2) Functional Guarantee test shall be carried out at site for over speed test and over load test, travel and hoist speed checks as per latest IS.

3) Car, landing door and car ceiling shall be of SS-304 sheet with thickness (min) 1.5 mm.

4) Min dimensions as specified in applicable IS 14665 (all five parts) shall be considered / provided for lift shaft / pit / car / M/c Room. Safety requirement shall be as per latest IS 14665 (Relevant part). Bidder to refer the layout attached in the specification for different buildings.

5) All Equipment's / facilities needed for erection & commissioning shall be in bidder's scope.

6) Bidder to note that all LT Power cables (Fixed power and control cables etc), Trailing cable and instrument / signal cable for elevator shall be as per electrical specification. Trailing cable shall be FRLS type (with strain bearing member).

7) Make of various bought out items & QAP shall subject to approval of BHEL / Customer during detail engineering stage without any commercial implication at contract stage.

8) Bidder shall supply erection and commissioning spares as required during E&C stage without any commercial implication.

9) Car frame and structure (guide brackets, supports etc) shall be painted with epoxy based paint for all elevators.

10) Protection class for motor shall be IP 54 and main control panel shall be min IP 21and elevator control shall be VVVF type. Push buttons, Car operating Panel, Landing Operating Panel, Landing door motor and other equipment shall be IP-54.

11) Factor of safety for rope shall be 12 (min).

12) All Landing door shall be fire rated for at min 1 hour or as per latest IS / as per the state statutory requirement whichever is more stringent.

13) Motor shall be S4 / S5 duty with insulation class F & temp rise limited to class B.

14) Bidder shall submit the following documents (min) for BHEL/customer approval during detail engineering stage:-

a) General arrangement of Elevator
b) Technical data sheet of elevator
c) Technical data sheet of motor along with power, control and trailing cable details

d) Wiring schematic diagram
e) MQP for elevator along with test procedure of various components.

15) Bidder shall comply to the quality requirements as enclosed with specification. Quality plan shall be submitted by the successful bidder for approval during detail engineering.

16) Bidder shall confirm that supply, installation and commissioning of elevator shall be completed within project schedule as indicated elsewhere from placement of intent / letter of intent.

17) Bidder shall be responsible for obtaining all necessary approval from statutory and regulatory body and lift inspector. However, purchaser will furnish required information time to time basis, if required.

18) Bidder shall include scaffoldings required in their scope of work.

19) Elevator shall be provided with AC VVVF type drive control system.

Bidder shall furnish the following documents only during tender stage as a part of technical bid. Any other technical documents furnished by bidder shall not be considered as the part of offer :-

1) Signed and stamped copy of electrical load list for each elevator
2) Signed and stamped copy of Deviation schedule (if any).
3) Signed and stamped copy of Compliance cum confirmation sheet.

Note : In case bidder fails to furnish any document specified above, bidder's offer shall be treated as incomplete and shall liable to be rejected.

3.0 SCOPE OF SERVICES

Scope of services will broadly include the followings:-

1) Complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection of complete elevator package.
2) Painting of all equipments / items within the battery limit.
3) Unloading, storage, handling and transportation at site for all items of elevator.
4) Minor civil and structural works shall be carried out by the bidder if required at site for which no additional commercial implication shall be entertained by BHEL.
5) Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities, if any, shall be arranged by the successful bidder at their own cost.
6) Functional testing of complete elevator package.
7) Preparation of civil input drawings including elevator pit, shaft, machine room etc.

8) Preparation of all necessary drawings / data sheets / documents / calculations as required for obtaining necessary local administration permits / approval from statutory authority and make arrangements for inspection and tests required thereby for necessary approval on behalf of the customer. Fees as required for obtaining approval from statutory bodies shall also be included in the scope of work of the bidder.

9) Any other service as required for making the installation complete in all respect and satisfactory erection and commissioning of the system.

10) Relevant requirements as per GCC, ECC & SCC.

11) Window Air conditioner of min 2 Ton capacity in the machine room which includes fans, air filter and accessories to prevent dust ingress in the machine room. However, successful bidder shall furnish the heat load calculation and capacity of air conditioner after considering all actual heat loads of elevator machine room during detail engineering stage for selection of final capacity of air conditioner.

12) 1/2 Kg CO2/suitable type Fire extinguisher in bidder scope. Fixing arrangement shall be provided in Car accordingly.

4.0 Exclusion

1) Complete civil works for hoist way, machine room, pit complete with the side enclosure (brick / RCC), interconnecting platform (if any) and monorail beam.

2) Electric hoist with travelling trolley of 3T capacity to facilitate handling of equipment in the machine room.

3) Power supply cable (AC 415 V, 3 Ph, 50 Hz) up to machine room level. Further cabling (all cables including power, control and instrumentation as per tender specification) shall be provided by the bidder.

4) Electrical exclusion as per separate scope sheet attached in the specification.

5.0 Operation

Elevator shall have provision to meet followings operational requirements:-

a) Selective simplex / duplex collective, automatic operation with or without attendant through illuminated push button station located inside the lift car.

b) Door operating shall be automatic door operation and electronic door protection system for opening / closing of car and landing doors.

c) Bidder shall provide car operating panel with luminous buttons, car position indication in car (both visual and audio) combined with direction arrows, overload

warning indicator, battery operated alarm bell and emergency light and fan and hands free speaker telephone set with suitable battery, charger and controls.

d) Bidder shall provide emergency indicator to indicate the location of elevator in case of elevator being stuck up between the floors through automatic flashers/ display (both audio and visual as out of service).

e) Two (2) push buttons, one for upward movement and the other for downward movement at each intermediate landing and one (1) push button at each terminal landing shall be provided in order to call the car. Digital hall position indicator at all floors, tell lights at all floors shall also be provided by the bidder.

f) All fixtures shall be in stainless steel face plates.

g) Push buttons shall be fixed in the car for holding the door open for any length of time required.

h) All other safety / protection / operation interlocks as required by IS – 14665 (all parts) latest edition.

6.0 Electric Motor

The driving motors shall conform to IS 325 and suitable for variable voltage variable frequency (VVVF) application. All motors shall be squirrel cage induction type, suitable for operation at 415 V (+/- 10% variation), 3 Phase, 4 wire, 50 Hz (+5% to -5% variation) supply. Motors shall be provided with class F insulation & temp rise limited to class 130 (B).

7.0 Controls

The control shall be variable voltage and variable frequency type and shall provide smooth and constant acceleration and retardation under all conditions of operation. Suitable control panels shall be provided in the machine room. The lift will be automatically stopped by upper and lower terminal switches. The elevators will have an emergency stop switch, limit switches and other safety devices according to statutory rule.

8.0 Cables and wirings

The cables used in the elevator installations shall conform to the latest edition of IS 4289. All wiring / cabling between the equipments in the lift machine room and that between the machine room and equipment in the lift well and at the landing shall be wired in HDP conduits / galvanised steel conduits to be supplied by the bidder. Alternatively, armoured cables may be used. However, bidder shall refer detailed specification of cables / wirings elsewhere in the specification.

9.0 Earthing

The elevator structures and all electrical equipments, including metal conduits shall be effectively earthed with the earth conductors provided in the machine room as per IS 3043.

10.0 DESIGN CRITERIA

The design criteria and equipment specification will be as follows:

i) The rated speed will be one (1) m/sec. Proper allowance will be made for impact and wear and the factor of safety for rope shall not be less than twelve (12) or as per IS 14665 (all parts). The suspension wire rope will confirm to IS-14665 or approved equivalent international standard.

ii) The lift will be providing with automatic travelling device which will take care of overrun and under run of the car and rope stretch that the car floor is within 6.0 mm from the landing level at the floors while in operation.

iii) The lift will be equipped with upper and lower terminal switches arranged to stop the car automatically within the limit of the top car clearance and bottom run-by, from the any normal operating speed.

iv) The elevator car shall be provided with SS-304 sheet fabricated, bright finished to approved shade (including landing doors of the car). Vitrified ceramic tile of matt finish flooring as indicated in the data sheet - A, concealed fan and indirect lighting, emergency lighting, intercom, car position and travel direction indicator.

v) As the elevator is to provide service in a power station, it is necessary for the equipment to be specially coated (painted). This will include application of anticorrosive paint as applicable. The electrical equipment will have enclosures meeting degree of protection as covered under electrical specification.

vi) The elevator as a whole will comply with relevant Indian Standard i.e. 14665 or approved international standard. The outline dimensions of electric lift shall meet the requirements of IS 14665 (latest edition).

vii) The elevator shall be provided with AC VVVF type drive control system.

viii) Doors are automatic, center opening with emergency key opening at all landings, horizontal sliding type for car as well as for hoist way. Trap door shall be provided by client as per IS-14665 (latest edition).

11.0 Other Technical Requirements

1) Characteristic curves of all motors shall be furnished by the bidder during detail engineering stage for approval showing torque, speed, current and voltage.

2) Electrical requirements shall be as per requirements enclosed elsewhere in the specification.

3) Complete elevator installation shall be in accordance with the requirements of concerned approving authority.

4) In case of any contradictory requirement amongst the various clauses within the specification and clarifications not having been sought by the bidders, the most stringent requirement as per interpretation of BHEL's engineer shall be final and binding on the bidder for which BHEL will not entertain any commercial implication.

5) Data sheets of various items shall be prepared by the bidder and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

6) GA drawing indicating design data, material of construction etc. shall be prepared by the bidder during detail engineering stage based on specification / contractual requirement and there should be no commercial implication on account of finalization of the drawings and documents.

7) O & M manual shall be furnished to BHEL / customer / consultant for approval during detailed engineering stage.

8) Field quality plan / quality assurance plan / check list shall be prepared by the bidder for each item of elevator and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

9) All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.

10) Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.

11) Bidder to note that all the drawings shall be prepared in Auto Cad - 2010 version and required number of hardcopies and soft copies shall be furnished to BHEL

during detailed engineering stage. Exact requirement of number of hard copies and soft copies of all drawings and documents as required by BHEL / customer / consultant shall be informed to the successful bidder during detail engineering stage and bidder to furnish the same for which no additional cost shall be entertained.

12) 21 days' time is required by BHEL to offer their comments on the drawings and documents being submitted by the bidder (during detailed engineering stage in the event of L.O.I being placed) from the date of receipt.

13) Civil works will be provided by BHEL / customer. Hence, bidder has to furnish the civil inputs in time. Bidder has to carry out the rectification in the civil works in the event of any changes in the civil input data furnished by them or delay in submission of input data by them. Bidder to furnish the civil foundation drawing along with the loading data for approval during detailed engineering stage showing / indicating the followings :-

a) Scope of work by BHEL and bidder shall be indicated with different legend or in the form of note.

b) Recommended locations of earthing pads.

c) Civil loads along with detailed calculation of loading

d) Details of pockets / cut outs as required for anchor bolts.

14) Bidder to depute competent designer (s) at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, minimum seven (7) days' notice shall be served for the same.

15) All the drawings which are required to be furnished to BHEL during detailed engineering stage shall include technical parameters, details of paints, BOQ / BOM etc in tabular form indicating all components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

16) All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.:-

a) All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.

b) All drawings and documents shall indicate the list of all reference drawings including general arrangement.

c) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view, all major self manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.

d) Specification / schedule of painting shall be made as a part of general arrangement drawing of each item indicating at least three (3) makes.

17) Bidder to assess the capability of their sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them. No deviations shall be entertained.

18) Bidder to furnish prices and unit price of each item of proposed system as per BHEL's price format only along with the final price bid.

19) Bidder shall check that specifications of all the items are available in the NIT specification. However, in the event of absence of specification for any item, bidder will approach BHEL to furnish the specification of missing items and new specification will be adhered by the bidder for which no commercial implication shall be entertained by BHEL.

20) Bar chart, list of drawings and documents including data sheet, manual calculation, quality plan, field quality plan, PG test procedure, list of sub – vendors (mechanical, C & I and erection and commissioning), technical specification and material of construction, painting specification / schedule, dispatch schedule etc. of various items as required by BHEL / customer / consultant shall be submitted to BHEL / customer / consultant during detail engineering stage for approval and the approved drawings / documents shall be adhered by the bidder without any commercial implication.

21) List of commissioning spares and tools and tackles in terms of numbers shall be furnished by the bidder along with the offer.

22) "Technical deviations" shall be clearly indicated in bidder's offer in prescribed format only.

23) All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No. and customer / consultant's drawing no; which will be forwarded to the successful bidder during detail engineering stage.

SECTION – C
DATA SHEET A

S. No.	DESCRIPTION	PASSENGER ELEVATOR		
1.	Elevator	**TG building**	**Service building**	**Admin building**
2.	Type of Service	Passenger elevator, Conventional Type	Passenger elevator, Conventional Type	Passenger elevator, Conventional Type
3.	Rated Load on Elevator	884 KG (13 Person)	884 KG (13 Person)	884 KG (13 Person)
4.	Quantity	3 Nos. (Three nos.)	1 Nos. (One nos.)	1 Nos. (One no.)
5.	Rated Speed of Lift	1.0 M/Sec	1.0 M/Sec	1.0 M/Sec
6.	Total Travel	21 M	21.25 M	8.50 M
7.	Nos. of floors to be served	Four (4) Nos. including Ground	Six (6) Nos. including Ground	Three (3) Nos. including Ground
8.	Method of control.	ACVVVF Control with automatic level adjustment.		
9.	Position of Machine Room	Directly above the lift Shaft.		
10.	Car enclosure construction, design and finish car.	SS -304, min 1.5 mm thick. sheet,		
11.	Design, construction, installation codes including car size, door size, Shaft size, Size of platform and car entrance.	As per IS: 14665 (all parts), latest edition		
12.	Car and landing door	Protected by central opening sliding stainless steel door (Horizontal bi-parting door).		
13.	Flooring	Vitrified ceramic tiles of mat finish.		
14.	Operation	Automatic simplex collective with and without attendant with provision for locking control in “auto” or “Attendant” position. Key type lock switch shall be provided.		
15.	Signal	Car position indicator in car, car position indicator at car floors, telltale lights at all floors, battery operated alarm bell and emergency light with suitable battery, battery charger and controls, Remote alarm shall be provided.		
16.	Method of operation of car and landing doors.	Power operated with automatic door opening and closing devices.		
17.	Lighting & fan	One cabin fan, two recessed fluorescent light fittings on car roof. Lux level : 100 min.		
18.	Power supply : a) Power b) Lighting & fan	415 Volts, (+/- 10% variation), 3 Phase, 50 Hz (+5% to -5% variation), combined voltage variation 10%, 4 wire system, 240 Volts, 1 Phase, 50 c/s.		

19.	Other requirements	Internal telephone wiring and telephone hand set to be provided. The external connection shall be provided by Customer. Also, automatic rescue device shall be provided.
20.	Additional requirements :-	
a)	Isolating cushion between car and car frame shall be provided.	Type of cushion shall be rubber pad or spring which shall be as per manufacturer's standard.
b)	Three pin plug with socket on car top	5/15A, 3 pin plug socket with switch on top of lift car and inside shaft to take care maintenance requirement.
c)	Car frame Material and type of construction	Steel and bolted construction
d)	Landing Door	Fire rated for min. 1 hour
e)	Type of operation	Automatic
f)	Door hanger tracks along with accessories shall be provided.	Required
g)	Safety shoes complete with accessories shall be provided.	Yes
h)	Safety device for door operation shall be provided.	Full length Infrared light curtain along with pressure limiter as an extra mechanical safety is required.
i)	Handrails on three sides of car	Mirror finish stainless steel
j)	False ceiling	Powder painted
k)	Emergency stop switch	Yes
21.	Control and operation	
	(a)Type of control	Simplex
	(b)Type of drive	Variable voltage variable frequency drive
22.	Car operating panel	Provided
	(a)Type of construction	Partial Height car operating panel (COP), Removable type from Car with SS face plate.
	(b)Push Buttons	Luminous push buttons with IP 54
23.	Car position indicator	Provided.
	(a)Type of construction	As per manufacturer's standard
	(b)Type of display	7 segment LED display.
24.	Push button station and call registered tell tale lights at each landing	Provided in each landing
	(a)Type of construction	Box type with SS face plate
	(b)Push Buttons	Luminous push buttons with IP 54
25.	Apron / Facia Plate provided as per IS 14665	Yes (To be provided by supplier)
26.	Emergency Light	Required
27.	Terminal buffers, their types and number of buffers	Spring buffers shall be Provided as per IS 14665.

28.	Load plate	As per manufacturer's standard / as applicable
29.	Counter weights frame	Fabricated Steel Construction
30.	Counter weight fillers	Cast Iron
31.	Number of Limit Switches	As per requirement
	a) Location	Bottom & top terminal
	b) Type	Electromechanical
	c) Operation	Cam Operated
32.	Controller and type	Selective Collective Controller with variable voltage variable frequency drive and Microprocessor based software controlled logic system
33.	Reverse phase relay and other protective devices	Required
34.	Car Safety & Governor	
	a) Stopping distance	As per IS:14665
	b) Type and mode of operation of Over speed Governor device	Centrifugal action
	c) Tripping speed and design code conforming to	As per IS 14665
	d) Location	At machine room
35.	Motor details	
	(a) Type	3 phase AC squirrel Cage Induction motor
	(b) Type of Duty	Lift Duty
	(c) Motor Duty	S4 /S5
	(d) Duty Cycle of Motor	60%
	(e) Applicable standard	IS:325
	f) No. Of Starts Per Hour	Elevator Motor shall be suitable for minimum of 150 Starts per hour.
	g)Direction of rotation	Both Clockwise & Anticlockwise
	h)Class of Insulation	F, temp rise limited to class B. Motor shall be provided with thermal class 130 (B) or better insulation.
	i)Method of Starting	AC Variable Voltage Variable Frequency Drive
36.	Door Motor	
	a) Equipment driven by Motor	Door
	b) Direction of rotation	Both Clockwise & Anticlockwise
	c) Type of enclosures	IP54
37.	Metallic Wire Mesh between Car & Counter Weight	Required
38.	Fire Man Switch	Required
39.	Sound Reducing Material	Isolation Rubber / other arrangement in the Machine shall be provided

40.	Automatic Rescue Device (Battery Drive)	Provided
41.	Trailing cables	FRLS type.
42.	Design seismic coefficient	According to IS 1893 - 1977
43.	Window Air condition in machine room	As per Machine room area (not less than 2T Capacity).
44.	1/2 Kg CO2/suitable type Fire extinguisher with fixing arrangement.	Provided.

SECTION C1-B
GENERAL REQUIREMENT

(General technical requirement, Special conditions for erection and commission, General conditions, engineering services)

CONTENT

GENERAL TECHNICAL REQUIREMENTS

1.00.00 CODES AND STANDARDS

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

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

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

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

1.05.00 In case of any change of code, standards and regulations between the date of purchase order and the date the Contractor proceeds with manufacturing the Owner shall have the option to incorporate the changed requirements. It shall be the responsibility of the Contractor to advise Owner of the resulting effect.

1.06.00 Successful Bidder to furnish two (2) sets of latest of national/inter-national codes and standards to owner.

2.00.00 RESPONSIBILITY FOR DESIGN

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

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

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

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

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

3.00.00 NAME PLATES (RATING PLATES)

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

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

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

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

4.00.00 SAFETY AND SECURITY

4.01.00 The design shall incorporate every reasonable precaution and provision for the safety of all personnel and for the safety and security of all persons and

property. The design shall comply with all appropriate statutory regulations relating to safety. All structures and equipment shall be designed and constructed to withstand every foreseeable static and dynamic loading condition, including loading under earthquake conditions, with an adequate margin of safety.

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

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

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

5.00.00 GUARDS

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

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

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

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

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

6.00.00 LOCATION AND LAYOUT REQUIREMENTS

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

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

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

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

a) The minimum width of clear access corridors around equipment shall be 1.2 meter.

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

c) The minimum clear height available between two consecutive floor slabs shall not be less than five (5) meters. A clear head room of 2.5m shall be maintained between the floor and any overhead piping/ cables or other obstruction. Adequate provision for natural ventilation and illumination shall be made as per good engineering practices.

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

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

elsewhere in this specification shall be complied with.

f) All rail/road crossings for pipe/cable racks shall be done with minimum 8 meters headroom from top of rail/road to bottom of rack. Similarly top cover over underground pipes/cables shall be minimum one (1) meter. For other detail refer to Annexure-II.

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

h) Interplant cable routing will be on overhead cable trays on pipe cum cable trestle or on cable trestle except where approved by purchaser/consultant. In exceptional case, small stretch of outdoor run of interplant cable routing may be taken through cable trench only with the Employer's prior approval.

i) Concept of various mechanical and electrical equipment location and building dimensions (including column-row spacing) as shown in Plot Plan/Floor Plan drawing are to be adhered to. Any departure from this suggestive layout is primarily not recommended.

7.00.00 OPERATION, MAINTENANCE & AVAILABILITY CONSIDERATIONS

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

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

7.03.0 Motorised lifting devices, i.e. hoists, chain pulleys, jacks, etc. shall be provided for handling and carrying out maintenance of any equipment and/or part having weight in excess of 2000 Kg. Suitable beams, hooks etc. for this purpose shall be provided in the buildings.

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

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

7.04.00 All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same material and workmanship as the corresponding parts of the equipment. Where feasible common

components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.

8.00.00 MATERIALS

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

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

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

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

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

9.00.00 LUBRICATION

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

9.02.00 Non ferrous capillary tubing shall be used throughout.

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

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

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

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

10.00.00 **LUBRICANTS AND CONTROL FLUIDS**

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

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

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

11.00.00 **OPERATION AND MAINTENANCE**

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

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

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

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

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

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

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

12.00.00 **PLANT LIFE AND MODE OF OPERATION**

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

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

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

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

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

Cold start-up (>72 hrs. shutdown)	:	6 per year
Warm start-up (between 10 to 72 hrs. of shutdown)	:	40 per year
Hot start-up (less than 10 hrs. shutdown)	:	160 per year

13.00.00 **PACKAGING & MARKING**

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

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

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

The above indicates the dimensions which can be normally transported on the

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

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

14.00.00 PROTECTION

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

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

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

piping, tubing and conduit shall be sealed and taped.

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

15.00.00 ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT

15.01.00 Environment Protection

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

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

15.01.01 For Liquid Effluent

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

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

15.01.02 For Air Emission

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

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

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

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

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

15.02.00 **Noise Level Requirement**

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

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

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

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

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

16.00.00 **INSPECTION AND TESTING**

16.01.00 **Inspection and Tests during Manufacture**

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

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

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

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

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

consultant for record purpose.

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

16.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Owner's Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer along with Defect Map.

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

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

16.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material or any other test as required by approved QAP/ Material specification.

16.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure or as required by design code of that part, for a period not less than one hour.

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

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

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

16.02.00 **Performance Tests at Site**

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

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

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

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

17.00.00 TRAINING OF OWNER'S PERSONNEL

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

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

17.01.00 Training at Contractor's Premises

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

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

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

60 heads	60
---	---

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

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

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

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

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

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

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

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

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

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

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

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

The Contractor shall provide qualified English speaking instructors and training

coordinator(s) during the tenure of the training programme.

17.02.00 **Operation and Maintenance Training at Site**

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

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

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

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

c) One (1) for Electrical Works ;

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

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

17.03.00 **On-the-Job Training**

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

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

17.04.00 For detail C&I training refer to Volume-VI, Section-9.

18.00.00 **DEVIATIONS**

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

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

ANNEXURE-I

LIST OF STANDARDS FOR REFERENCE

a) International Standards Organisation (ISO).

b) International Electro-technical Commission (IEC).

c) American Society of Mechanical Engineers (ASME).

d) American National Standards Institute (ANSI).

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

f) American Institute of Steel Construction (AISC).

g) American Welding Society (AWS).

h) Architecture Institute of Japan (AIJ).

i) National Fire Protection Association (NFPA).

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

k) Japanese Electro-technical Committee (JEC).

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

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

n) Instrument Society of America (ISA).

o) National Electric Code (NEC).

p) Heat Exchanger Institute (HEI).

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

r) Hydraulic Institute (HIS).

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

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

u) Applicable German Standards (DIN).

v) Applicable British Standards (BS).

w) Applicable Japanese Standards (JIS).

x) Electric Power Research Institute (EPRI).

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

z) Bureau of Indian Standards Institution (BIS).

aa) Indian Electricity Rules.

bb) Indian Boiler Regulations (IBR).

cc) Indian Explosives Act.

dd) Indian Factories Act.

ee) Tariff Advisory Committee (TAC) rules.

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

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

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

ii) The Air Prevention and Control of Pollution Act.

jj) The Environmental Protection Act

kk) The Public Liability Insurance Act.

ll) The Forest Conservation Act

mm) The Wildlife protection Act.

nn) The EIA Notification, 1994.

oo) IS: 14665-Specification for Electric Traction Lift

pp) Any other statutory Codes/Standards/Regulations

ANNEXURE-II

CRITERIA FOR LAYOUT

PLOT PLAN LAYOUT REQUIREMENTS

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

	ITEM	SPECIFICATION REQUIREMENT
4.	Required minimum vertical clearance	
a)	Under pipes/cable racks at road crossings	8.0 Metres
b)	Soil coverage over underground pipes	1.0 Metre (minimum)
5.	Railway Wagon clearance	Rules of the Indian Railways
6.	Minimum Clearance between any road edge and building/structure/ any fixed installation.	3 Metres
7.	Required level, above the local developed grade level, of	
a)	top of all roads	150 mm above FGL
b)	all outdoor paved areas	100 mm above FGL
c)	Temporary storage areas, workshops, offices, residence etc. required at the time of erection work.	Yes
d)	Green belt around power plant area	As per environmental guidelines of MOEF, Govt. of India.
BUILDING/ EQUIPMENT LAYOUT REQUIREMENTS		
A.	Minimum clear space required at all working and walking areas for operating & maintenance personnel	
1.	Horizontal, in all directions	
a)	Adjacent to any electrical equipment, electrical cables, running (rotating/reciprocating) equipment, safety valve or vent/drain pipe outlet, pipe/ equipment of surface temperature exceeding 60°C.	1200 mm
b)	Adjacent to any other plant facilities (including walls/structures)	1000 mm
2.	Vertical (head-room clearance)	
a)	Under any pipe/equipment surface of temperature exceeding 60°C and any electrical cables or other electrical items.	2.5 Metre
b)	Under any other plant facilities (including structures, pipes etc.)	2.5 Metre

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

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

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

PROJECT MANAGEMENT AND SITE SERVICES

CONTENT

PROJECT MANAGEMENT AND SITE SERVICES

1.00.00 PROJECT MANAGEMENT SERVICES

1.01.00 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) Project Safety Management

e) Quality Assurance, Inspection & Expediting

f) Construction Management

g) Spares Management

h) Erection & Commissioning Management

Detailed responsibilities in the above areas are discussed below :

1.02.00 Organisation

1.02.01 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 1.01.00, who, in turn, will report to the Project Manager for all matters relative to this contract.

1.02.02 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.

1.02.03 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.

1.02.04 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 at 1.01.00 above. The expected number of executives at different levels shall also be indicated, separately for headquarters, central coordination cell and site organisation.

1.03.00 **Implementation Schedule**

The schedule for the completion of the Project would be as follows :

As per project specific special condition of contract.

To achieve these targets, the Contractor shall furnish to the Owner, various schedules as defined below:

1.03.01 Engineering Schedules

These schedules shall cover various design submissions indicating different engineering activities to be performed. Such schedules shall be furnished by the Bidder for each and every plant/systems/ equipment item covered in the scope of this specification.

1.03.02 Manufacturing Schedule

The Contractor shall submit to the Engineer his manufacturing and delivery schedules for all equipment within thirty (30) days from the date of issue of the Letter of Intent (LOI). Such schedules shall be in line with the detailed network for all phases of the work of the Contractor. Such schedules shall be reviewed, updated and submitted to the Engineer, once in every two months thereafter, by the Contractor. Schedules shall also include the materials and equipment purchased from outside suppliers.

1.03.03 Erection Schedules

In order to achieve the overall completion schedule, the Contractor shall provide the Owner all the information covering erection sequence, testing and commissioning activities. These schedules may be based on the recommended erection procedures and will be subject to discussions/ agreements with the Owner subsequent to the award of contract.

1.03.04 The successful Bidder shall have to provide all the above schedules (i.e. 1.03.01, 1.03.02 & 1.03.03) in a tabular form in addition to that in the form of L2 & L3 networks and these shall necessarily include information not limited to the earliest and latest dates for various activities/submissions and also any related constraints. However, the Bidder shall include in his proposal a Level-1 (L-1) network showing the major activities and various milestones to achieve the above mentioned completion schedule.

1.03.05 The Contractor shall provide the Owner the original disc/software for all such schedules alongwith requisite no. of copies (as required by the Owner) within an agreed time schedule. This time schedule will be agreed between Owner/Bidder at the time of award of contract. The Contractor's project management software shall be compatible with that of the Owner and the input data shall be furnished to the Owner in a manner compatible with Owner's project management software, SAP.

1.04.00 **Detailed Responsibilities**

1.04.01 Planning & Monitoring

a) Planning

The Bidder shall prepare a Master Network Schedule in the form of PERT network.

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 packagewise 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.

1.04.02 Engineering Management

Based on the master network for the project (L-1) the Contractor will 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 Contractor 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 Intent and finalised within one (1) month thereafter.

All such networks shall be provided in MS PROJECT software as well as in other format / software suitable to Owner.

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.

TSGENCO is implementing SAP ERP. Hence the bidder apart from submission of the hard copies shall upload all the documents, drawings etc. in soft format in the relevant C- folder environment (web based) and comply with the additional requirements, if any.

1.04.03 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 will 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.

1.04.04 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 would 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 Intent. 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 would 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 twelve (12) 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 1.04.03 above.

1.04.05 Construction Management

Based on the L-1 Master Network Programme, within two (2) months of the issue of Letter of Intent, 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 in charge of the Contractor with the Owner's project coordinator as well as the site planning representative. The erection programme will also identify the sequential erectable tonnages that are required for various equipment which should 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.

1.04.06 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 thereafter.

1.05.00 **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 of the project will be held initially at least once in two (2) months at Hyderabad/site/ at the discretion of the Owner.. 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.

1.06.00 **Owner's Consultant**

The Owner would appoint a consultant to assist him in some of the areas mentioned at 1.01.00 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.

1.07.00 **Commissioning Management**

1.07.01 For commissioning of the various equipment/system covered under the scope of contract, Owner will form an organisation structure which may consist of the following committees. The Contractor shall nominate his representative on one or more of the committee as decided by the Owner:

a) Steering Committee
b) Commissioning Panel.
c) Working Parties
d) Testing Teams.

1.07.02 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.

1.07.03 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.

2.00.00 **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 :

2.01.00 Arranging material despatch from the shop by rail/road and/or sea as applicable.

2.02.00 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.

2.03.00 Unloading of materials at Railway Station/Railway Siding inside project area/ Road Transportation, 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 as well as storing, preservation of material at site.

2.04.00 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.

2.05.00 Transportation of materials to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.

2.06.00 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 deaerator 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.

2.07.00 Supply and application of the final paints and first fill lubricants on all the equipment to be erected under this specification. Supply of chemicals, lub oils and other consumables upto COD.

2.08.00 For the purpose of erection and commissioning the Contractor's scope of work shall include but not be limited to the following :

2.08.01 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.

2.08.02 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.

2.08.03 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.

2.08.04 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.

2.08.05 All structural steel fabrication and erection work as detailed elsewhere in the specification.

2.08.06 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.

2.08.07 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, Electrical Inspector etc. for respective portions of work under the jurisdiction of such statutes or laws.

2.08.08 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.

2.08.09 The successful Bidder shall arrange for Tower cranes of adequate capacity for speedy erection activities.

2.09.00 **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.

2.10.00 **General Guidelines for Field Activities**

2.10.01 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.

2.10.02 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.

2.10.03 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.

2.10.04 Time is the essence of the Contract and the Contractor shall be responsible for performance of his Work in accordance with the specified construction schedule. If at any time the Contractor is falling behind the schedule, he shall take necessary action to make good of such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such action in writing to the Engineer, satisfying that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

2.10.05 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.

2.10.06 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.

2.10.07 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.

2.10.08 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.

2.10.09 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.

2.10.10 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 and as per the Standards.

2.10.11 It may sometimes be necessary to remove some of the erected structural members to facilitate erection of bigger/pre-assembled equipment. In such cases, the 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.

2.10.12 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.

2.10.13 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, carryout the hydraulic test of oil coolers, etc.

2.10.14 It is responsibility of the Contractor to do the alignment etc. if necessary, repeatedly to satisfy Engineer, with all the necessary tools & tackle, 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.

2.10.15 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.

2.10.16 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.

2.10.17 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.

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

2.10.19 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.

2.10.20 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.

2.11.00 **Safety**

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

2.11.01 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.

2.11.02 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.

2.11.03 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.

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

2.11.05 All requisite tests & inspection of handling equipment, lifting tools & tackle shall be done by the Contractor and certified copies shall be supplied to the Owner. Defective equipment shall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.

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

2.11.07 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.

2.11.08 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.

2.11.09 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.

2.11.10 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.

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

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

2.12.00 **Taking Delivery & Storage**

2.12.01 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.

2.12.02 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.

2.12.03 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.

2.13.00 **Site Welding & Heat Treatment**

2.13.01 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.

2.13.02 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.

2.13.03 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.

2.13.04 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.

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

2.13.06 Preheating/post heating 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, thermocouples, compensating cables, insulation materials like mineral wools, asbestos cloth, ceramic beads, asbestos rope, etc. required for the heat-treatment and stress relieving works. During pre- heat/stress relieving operations, the temperature shall be measured at one or more points as required by attaching thermocouples and recorded on a continuous printing

type recorder. All the record graphs for the heat treatment works carried out shall be got signed by the Engineer prior to the commencement of each cycle and handed over to Engineer on completion. The graphs will be the property of Owner. The Contractor has to provide thermo-chalks temperature recorders, thermocouple attachments, units, graph sheets, etc. required for the job and maintain them in good condition.

2.13.07 All electrodes shall be baked and dried in the electric/electrode drying oven to the required temperature and for the period specified by the Engineer before they are used in erection work. The electrodes used shall be as per IS-814, IS-815, IS-1442, IS-7280 and other codes as applicable, and shall be of approved reputed manufacture. The electrodes shall meet the requirement of the pipe material. No electrode manufactured more than 12 months ago and the type covered under certificate issued after conducting tests more than 6 months ago shall be used. All electrodes shall be preserved at works and at site as per manufacturer's recommendations.

2.13.08 Oxy-acetylene flame or Exothermic chemical heating for stress relieving is not permitted. Heating shall be by means, of electric induction coil or electric resistance coil.

2.13.09 It may become necessary to adopt inter layer radiography/MPT/UT depending upon the site/technical requirement necessitating interruptions in continuation of the work and making necessary arrangement for carrying out the above work.

2.13.10 Gas tungsten arc welding process (TIG) shall be adopted for all root pass welds except for structural works until 4.75 mm thickness is deposited. Subsequent welding after root pass can be carried out by manual metal arc welding with coated electrodes. For pipes of thickness less than 6 mm the entire welding has to be carried out by TIG welding.

Fillet weld shall be made by shielded metal arc process as per applicable codes.

However, the Engineer will have the option of changing the method of welding as per site requirement. The method adopted for manual arc welding shall be weaving technique and the width of weaving shall not exceed 1.5 times of the dia. of the electrode.

In case of deviation from welding process and electrodes, the Contractor shall take approval of the Owner prior to adoption of same.

2.13.11 The root pass for butt joints shall be such as to achieve full penetration with complete fusion of root edges.

2.13.12 Each pass shall be cleared and freed of slag before the next pass is deposited.

2.13.13 On completion of each run, craters, weld irregularities, slag etc. shall be removed by grinding or chipping.

2.13.14 Each layer of welding shall have an even and smooth appearance.

2.13.15 Welding sequence shall be adjusted in such a way that distortion due to welding shrinkage is minimised. Further any movement, shock or vibration during welding shall be avoided to prevent weld cracks.

2.13.16 Proper protection of welders and the work shall be taken during periods of rain. No welding shall be carried out when surface to be welded are wet from any cause.

2.13.17 Following will be stages of inspection during welding :

a) Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensionally and to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage will depend upon on criticality as specified by Engineer.

b) Joint fit up will be a stage of inspection. Misalignment after fit up may vary from 0.3 mm to 1.6 mm depending on outside diameter and thickness.

c) All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

2.13.18 All welded joints shall be painted with anti-corrosive paint immediately on completion of radiography and stress-relieving.

3.00.00 PROJECT INFORMATION AND MANAGEMENT SYSTEM, INCLUDING DCOUMENT MANAGMENT SERVER (DMS)

3.01.00 Contractor shall submit as part of its Work Scope detailed documentation as outlined in this section and / or required by the Technical Requirements. The content and format of the documentation to be submitted are subject to Owner's approval.

3.02.00 Contractor shall utilise a computer based system for control and management of project documentation. The system must be capable of producing customized reports and information on demand. This control system should have been successfully applied to similar projects and be familiar to the project control personnel selected. Contractor's detailed project documentation plan shall identify all documentation requirements for the project, the party responsible for production of the document, the basic content of the document and the required timing for issue. This plan shall include, but not be limited to the details of all Drawings to be produced, plant specification / definition documentation, equipment orders and manuals. The documentation identified shall be entered into the computer based control system The database thus created shall be capable of being sorted and

ordered on a variety of selected parameters such as document type, subject description, responsible party, start date and finish date, to enable review and update to be conducted only on those documents which are relevant.

3.03.00 Regular documentation control progress reports shall be prepared by the Contractor to record the status of documentation. In the event either Party or Engineer expresses concern with the content of such progress reports, the accuracy of progress reports, status of documentation production and other such matters, the concern will be identified to the Project Manager. Within five days of notification of this concern, the Project Manager will attend a meeting with relevant Owner Representatives and provide details of specific actions to be initiated to satisfactorily overcome the difficulties identified. It will be the Project Manger,s responsibility to initiate whatever action is necessary to ensure that the production of documentation is completely in accordance with Project Information Management System (PIMS).

3.04.00 Within 90 days after Effective Date of Contract, the Contractor shall establish an integrated PIMS which will support the needs of Project and management, detail design and engineering, procurement, construction and operation, and maintenance.

PIMS shall utilise software which links various software and database programs to form a composite system. The typical scope of PIMS shall include, but not be limited to, the following:

(a) Power plant systems and equipment data, from which Project specific flow diagrams, data sheets and other integrated data are derived. The Power plant systems and equipment data, from which Project specific flow diagrams, data sheets and other integrated data are derived. This data shall include, but not be limited to, the following:

(i) System descriptions and design requirements and design criteria

(ii) Equipment and material technical specifications for all engineering disciplines

(b) Detail engineering data to create flow diagrams, plant arrangements, piping configurations, equipment layout and design, electrical and instrumentation systems, structures, and other systems. The software tool used shall be capable of manipulation and storage of plant layout and design information. The 3D model of the plant shall also contain details of the various components like pipe, structural steel work, etc., and relevant information shall be available on-line from relevant data base. Software shall be multi-user, multi-access nature allowing the designers of Contractor and major Sub-Contractors, if required, to work in interactive real time environment and software shall be capable of interference checking. The software shall allow access to different types of information held in the database. It shall estimate the type and quantity of materials required to build the plant and it shall be possible for such data to be taken off the system at any time.

(c) Construction data to monitor and manage site activities, including material control, scheduling and progress, quality control, start-up and testing, operation, maintenance, training, and all other site functions.

(d) Plant design and construction records to provide data for safe and efficient maintenance and operation. Records to include may be maintenance schedule, man power tracking, tools, spare parts, and test equipment inventory, equipment list, drawing, control, technical specifications, and equipment instruction manuals.

3.05.00 The PIMS shall be installed in a distributed processing array system and operated through personal computer work stations at the Contractor's site office. A complete integrated system shall be implemented. This system shall be utilised by Contractor during the Project execution.

ENGINEERING SERVICES

CONTENT

ATTACHMENTS

ENGINEERING SERVICES

1.00.00 **GENERAL**

1.01.00 As part of the overall project management activity, the Contractor shall be responsible for proper engineering and co-ordination of activities during various phases of execution of the contract. The Contractor shall identify a person, designated as Project Manager, with whom the Owner, the Consulting Engineer or the Review Consultant shall interact on matters related to engineering as well as execution of the contract. The Project Manager shall be the single-point contact person on behalf of the Contractor and shall be responsible for all engineering co-ordination. The Owner/Consultant/Review Consultant shall interact with the Project Manager only on all matters of co-ordination between the Owner and the Contractor or on matters involving the Contractor, his manufacturing units and sub-vendors. For the purpose of expediting the Owner or his representative may sometimes interact with the manufacturing units or sub-vendors of the contractors. However such interaction will not, under any circumstance, dilute the responsibility of the Contractor to provide a fully engineered and co-ordinated package under this contract.

1.02.00 On finalization of the contract, a procedure for exchange of engineering information will be mutually agreed and finalized between the Owner and the Contractor.

2.00.00 **DESIGN COORDINATION MEETING**

The Contractor and his sub-vendors will be called upon to attend design co-ordination meetings with the Engineer, other Contractors and the Consultants of the Owner during the period of execution of contract. The Contractor including his sub-vendors shall attend such meetings at their own cost at Owner's or Consultant’s office in Kolkata or at mutually agreed venue as and when required and fully cooperate with such persons and agencies involved during those discussions.

3.00.00 **CO-OPERATION WITH OTHER CONTRACTORS AND CONSULTING ENGINEERS**

The Contractor shall agree to cooperate with the Owner's other Contractors and Consulting Engineers and freely exchange with them such technical information as is necessary to obtain the most efficient and economical design and to avoid unnecessary duplication of efforts. The Engineer shall be provided with copies of all correspondences addressed by the Contractor to other Sub- contractors and Consulting Engineers in respect of such exchange of technical information.

4.00.00 **GUIDELINES FOR ENGINEERING SERVICES**

4.01.00 Prior to commencement of the engineering work as part of design submissions, all aspects of design viz., criteria for selection and sizing of all equipment and systems, design margins etc. including that for structural steel and civil work shall be outlined and these shall form the basis for the detailed engineering work.

4.02.00 Engineering work shall be performed on modern and proven concepts and internationally accepted good engineering practices but fully compatible with the Indian environments. Owner shall have the right to review and approve the engineering work by themselves and/or through consultant and ask for any clarifications and changes/modifications to the work performed by Contractor.

4.03.00 At any stage during the performance of assignment, the Contractor may be required to make certain changes/modification/improvements in design/ drawing/other documents which are applicable to 800 MW Unit, which in the opinion of the Owner could result in better improved design, layout, operability, plant availability, maintainability, reliability or economy of the plant and its systems/sub-systems in view of revised and more accurate information/data available at a later date(s) or feedback(s) received during execution / operation of similar units. Such changes / modifications/ improvements required could be identified by Owner and/or consultant and mutually discussed. Owner requires the Bidder to incorporate such action in the subject assignment appropriately without any additional cost liability and time implication to the Owner and same shall be within the responsibilities and scope of the Contractor.

4.04.00 During the course of review of detailed engineering stages, it may be essential in the opinion of Owner to obtain certain classified data for review purposes only. In case Owner so desires, the Bidder shall submit such data to Owner.

4.05.00 During the course of review of detailed engineering, it may be essential in Owner's opinion to obtain data and information on similar equipment and plants engineered by the Bidder. In case Owner so desires the Bidder shall submit such data and information to the Owner.

4.06.00 It is not the intent to give details of every single task covered in the total engineering work to be carried out by Contractor, however, all engineering work required for the satisfactory completion of the plant/systems as specified shall be carried out by the Contractor. Broadly, the following are the minimum requirements in respect of scope of major items of work:

4.06.01 Preparation, updating and finalisation of scheme drawings, control and interlock diagrams, detailed and fully dimensioned layout drawings (plant layout and equipment layout detailed plan, elevation and cross-sectional drawings at different elevations / floor levels) covering all mechanical, electrical, C&I, civil and structural items, equipment, systems and facilities. Drawings and Schedules prepared by the Contractor from time to time, as detailed designs are developed, shall be submitted for Owner's / Consultant's

approval before the work is taken up. Revisions, corrections, additions to drawings and schedules shall not be considered to change the scope of work.

4.06.02 Preparation of detailed technical specifications including data sheets, tender drawings and bill of material for all bought out items, as also finalisation of corresponding sub-contractors.

4.06.03 Review of sub-contractor's data, drawings, design calculations, schedules, bill of materials, instruction manuals etc. for all equipment, before forwarding them to Owner/Consultant for approval.

4.06.04 Preparation of civil construction drawings for all equipment showing foundation details and full details regarding equipment loads, floor openings, details of embedments etc. required for preparation of civil construction drawings and also as referred at relevant sections of Scope, Terminal Points & Exclusions. These documents shall be preceded by appropriate design calculations, static and dynamic analysis as necessary.

4.06.05 Preparation and finalisation of process piping and instrumentation diagrams and schematics, complete in all respects for all systems/packages of the power plant.

4.06.06 Preparation of consolidated schedules and bills of materials, including line numbers, tag numbers, source of supply, service conditions, specifications, materials, types and connections details, quantities for items of the plant including dampers, steam traps, strainers, instrumentations, ducting.

4.06.07 Sizing of all piping and equipment as per the stipulated design criteria; carrying out of flexibility analysis/dynamic analysis as necessary; hangers & support engineering.

4.06.08 Final revision of all documents including preparation and compilation of Instruction Manuals for installation, commissioning, operation and maintenance for all equipment and systems. Refer clause 5.00.00 for the specific requirement in this regard.

4.06.09 Certification and submission of final as-built drawings for all areas.

4.06.10 Preparation and compilation of all drawings, schedules and instructions which may be required at site, whether separately mentioned or not.

4.06.11 All erection and assembly drawings which may be required at site.

4.06.12 For all bought out item packages, the Contractor shall provide complete material / component list along with detail specification, drawings, component part no. etc. during detail engineering stage prior to final approval. Such approved drawing/document shall be made available at site in adequate number prior to commencement of work. Moreover, such document/drawing shall be provided in soft form (CD)

4.06.13 Preparation of necessary documentation, design calculations etc. required for submission to statutory authorities like IBR, Chief Electric Inspector, Factory Inspector etc.

5.00.00 **OPERATING MANUALS AND MAINTENANCE INSTRUCTIONS**

5.01.00 The Contractor shall provide at least six (6) months before the time of commissioning and before taking over of the plant and equipment, all necessary maintenance manuals and operating instructions. The instruction manual shall be submitted in the form of one (1) soft copy in CD and 15 hard copies as per distribution schedule (Annexure-1).

5.02.00 The information provided, which shall be contained in loose leaf stiff backed covers, shall include :

a) A complete inventory of all main items of plant, with identification details.

b) Service manuals for all plant and equipment giving full descriptions of the main items and auxiliary items such as power packs, hydraulic equipment, actuators, lubricating pumps, etc.

c) A separate electrical manual covering items such as switchgear, cabling, instrumentation, controls, cabling layouts and wiring diagrams.

d) A schedule of recommendations for routine maintenance of all electrical and mechanical equipment, recommended inspection point, information on detection, cause and rectifications of troubles & faults.

e) A lubrication schedule with all necessary drawings diagrams to identify the lubrication points.

f) Manufacturer's literature.

5.03.00 The instruction manual shall be subject to the approval of Owner.

6.00.00 **PLANT HANDBOOK**

The Contractor shall submit to the Engineer, a preliminary plant handbook preferably in A-4 size sheets which shall contain the design and performance data of various plant, equipment and systems covering the complete project including single line flow diagrams, within twenty four (24) months from the date of his acceptance of the Letter of Intent. The final plant handbook complete in all respects shall be submitted by the Contractor six (6) months before start-up and commissioning activities. The plant handbook shall be submitted as per distribution schedule.

7.00.00 **CONTRACT STAGE DOCUMENT SUBMISSION AND APPROVAL PROCEDURE**

7.01.00 Within fifteen (15) days to one month of issue of Letter of Intent (LOI) by the Owner, the Contractor shall furnish a schedule of drawings and design

document to be submitted by him to the Owner/Engineer indicating dates against each document.

The documents shall be divided into two categories : a) for approval and b) for information/further engineering and co-ordination by the Owner.

In preparing this schedule, the Contractor shall allow two (2) weeks from date of receipt for review and comments by the Owner/Engineer for each submission of a document.

This document submission schedule shall require approval by the Owner/ Engineer.

7.02.00 All contract documents shall be marked, without fail, with the name of the Owner, the Project, the specification title and number and the unit designation.

All dimensions shall be in metric units.

All notes, markings etc. shall be in English.

7.03.00 Documents/Drawings, submitted during tender stage, shall be revalidated or revised as required and submitted as certified contract document for approval / information of the Owner/Engineer.

7.04.00 Unless specified otherwise, the following categories of documents/drawings would require approval of the Owner/Engineer:

a) List of sub-vendors (from Owner only)

b) System scheme and instrumentation diagrams

c) Design basis justifying selection of equipment & process parameters where not specified in the Contract

d) Equipment data sheets and general arrangement drawings

e) Materials of construction

f) Layout drawings.

g) Operation logic diagrams.

h) Typical control circuit.

i) Drawings of Instrumentation and control.

7.05.00 Unless specified otherwise, the following categories of documents/ drawings would be treated for information/further engineering by the Owner/Engineer. The Contractor shall, however, incorporate all additional information and clarifications in these documents / drawings as and when desired by the Owner/Engineer.

a) Equipment foundation drawings.

b) Equipment cross-section drawings, product literature etc. which are of proprietary nature.

c) Predicted performance curves of equipment.

d) Various bills of quantity, schedules etc.

e) Piping fabrication drawings, isometrics etc.

f) Panel wiring diagrams.

g) Instruction/Operation manuals.

h) Service manuals and trouble shooting guide for C & I system including field instruments.

i) Cable schedule and interconnection chart.

j) Drive/feederwise control scheme showing all external interfaces.

In essence, the Contractor is solely responsible for corrections and adequacy of design & engineering for documents under this category.

7.06.00 Upon review, the Owner/Engineer shall put his remarks and one of the following action stamps on the drawing/document:

a) A - Drawing submitted as approved, proceed with fabrication

b) B - Drawing approved subject to comments noted, proceed with fabrication, considering our comments. Correct as necessary and resubmit for record.

c) C - See attached memo.

d) D - Correct your original drawing incorporating our comments and resubmit for approval.

e) E - Information furnished is noted.

f) F - Prints not enclosed

For action stamps in category (c) & (d), documents must be resubmitted for review by the Owner/Engineer. For action stamp in category (b), further review by Owner/Engineer would not be necessary provided the Contractor agrees & incorporates the comments made on the document.

Except for action stamp under category (c) & (d), the Contractor can proceed with manufacturing and other sequential activities for those areas of a drawing/document which do not have any review comment by the Owner/ Engineer.

The Owner/Engineer may accord approval in category (c) or (d) in more than one submission of a document till he is satisfied that the intent of the specification has been fully complied with. The Contractor shall be responsible for delay in such cases and no extension of time shall ordinarily be allowed on such grounds. Approval of contract documents by the Owner/ Engineer shall not relieve the Contractor of his responsibility for any errors and fulfillment of contract requirements.

The Contractor's work shall be in strict accordance with the finally approved drawings and no deviation shall be permitted without written approval of the Owner/Engineer.

7.07.00 Except key plan/general yard plan, any layout drawing requiring scrutiny shall not be drawn to a scale less than 1:50.

7.08.00 For review by the Consulting Engineer, the Contractor shall furnish soft copies of drawings & documents and three (3) prints of each drawing/ document. Two (2) prints of such submission shall also be sent to the Owner. After review, comment/approval will be sent to the Contractor. Upon action under category (a) or (e), the Contractor shall directly distribute the documents to the various offices of the Owner and other agencies in number of copies as specified in the contract document. Such distribution copies shall be marked with the reference and date of the letter by which the Owner/ Engineer has accorded his final approval. Penal action shall be taken against the Contractor for any unauthorised revision in the drawings so distributed from the drawings approved by the Owner/Engineer. The contractor shall furnish three (3) CDs of all as built/final drawings for Owner/Consultant site.

7.09.00 In case of contradiction between the stipulations above and those stated elsewhere in the specification, the stipulations herein shall prevail.

ANNEXURE-1

DISTRIBUTION SCHEDULE

S. No	Description	TSGENCO								Consultant			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/	SE/ Civil	SE/E&M /	DE Constr.		HYD	BTPS		
A	**Letter Of Intent or Contract Documents**	1	1	1	S	1	2	2	1	1	1	1	2	
B	**Vendor Drawings**													
1.	Preliminary	1	1	1	2	1	1	2	2	12	1	-	S	
2.	Return preliminary with comments	-	-	1	2	1	1	1	1	S	1	-	1	
3.	Final and any revision thereof													
	a. Civil	1	1	6+1T	1	1	6+1T	1	-	2+1T	1	1	S	
	b. E&M	1	1	1	6+1T	1	1	6+1T	1	2+1T	1	1	S	
C.	**Design Drawings**													
1.	Preliminary													
	a. Civil	1	1	2	1	1	2	1	1	4	1	1	S	
	b. E&M	1	1	1	2	1	1	2	1	4	1	1	S	
2.	Released for construction													
	a. Civil	1	1	2	1	1	6	1	1	1	1	2	S	
	b. E&M	1	1	1	1	2	1	6	1	1	1	2	S	
3.	Return marked 'As built'													
	a. Civil	-	-	1	-	-	1	-	-	1	1	S	1	
	b. E&M	-	-	-	1	-	-	1	1	1	1	S	1	
4.	As built drawings													
	a. Civil	-	-	1+1T	-	2+1T	5+1T	-	1	1+1T	-	1	S	
	b. E&M	-	-	1	2+1T	2+1T	-	5+1T	1+1T	1+1T	-	1	S	

S. No	Description	TSGENCO								Consultant			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/	SE/ Civil	SE/E&M /	DE Constr.		HYD	BTPS		
D	Progress Report Monthly													
1.	Equipment vendor	1	1	1	2	1	1	2	1	1	1	1	S	
2.	Consultant	1	1	2	2	1	1	2	1	S	1	1	Nil	
E	Test & Inspection Reports													
1.	Equipment manufacturer													
	a. Civil	1	1	1	2	1	1	1	-	11	1	1	S	
s	b. E&M	1	1	-	2	1	-	1	1	11	1	1	S	
2.	Consultant	1	1	-	2	1	-	1	1	S	-	1	-	
F	Instruction Manuals/Data Books													
1.	Equipment manufacturer													
	a. Civil	1	1	1+1T	1	1	6+1T	1	1	2+1T	1	1	S	
	b. E&M	1	1	-	3+1T	1	-	6+1T	2	3+1T	1	1	S	
2.	Consultant	1	1	-	10+1T	1	-	15+1T	-	S	1	1	Nil	
G	Consultant	1	1	1	8+1T	1	1	2	1	1	1	1	S	
H	Design Calculations	1	1	1	8+1T	1	1	2	1	1	1	1	S	
I	Final consulting Engineering Report	1	1	1	10	1	1	2	1	S	1	1	Nil	

S – Source, T – Transparency & Soft Copy on CD,

TSGENCO : Telangana State Power Generation Corporation Limited

Director, Projects, Hyd : Director/ Projects, TSGENCO, Vidyut Soudha, Hyderabad – 500 082

QUALITY ASSURANCE REQUIREMENTS

CONTENT

QUALITY ASSURANCE REQUIREMENTS

1.00.00 **QUALITY ASSURANCE PROGRAMME**

1.01.00 To ensure that the equipment and services under the scope of Contract whether manufactured or performed within the Contractor's works or at his Sub-contractor's premises or at the Owner's site or at any other place or work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Owner/Authorised representative after discussions before the award of contract. A quality assurance programme of the Contractor shall generally cover the following :

a) His organisation structure for the management and implementation of the proposed quality assurance programme.

b) Documentation control system.

c) Qualification data for Bidder's key personnel.

d) The procedure for purchase of materials, parts, components and selection of Sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.

e) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls.

f) Control of non-conforming items and system for corrective actions.

g) Inspection and test procedure both for manufacture and all site related works.

h) Control of calibration and testing of measuring and testing equipments.

i) System for quality audit.

j) System for indication and appraisal of inspection status.

k) System for authorising release of manufactured product to the Owner.

l) System for handling storage and delivery.

m) System for maintenance of records.

n) Furnishing of quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per format enclosed at Annexure-I to this section for Owners approval

o) Internal standards, if referred in the quality plans shall generally be compatible with National / International standards and shall be mentioned in the quality plans. Alternatively bidder shall furnish extracts of the internal standards detailing out acceptance norm for the product / material.

2.00.00 GENERAL REQUIREMENTS - QUALITY ASSURANCE

2.01.00 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the Contractor for some of the major items is given in the respective technical specification. This is however, not intended to form a comprehensive programme as it is the Contractor's responsibility to draw up and implement such programme duly approved by the Owner/Consultant. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder, separately in the format attached at Annexure-I and will be submitted to Owner/Authorised representative for approval. Schedule of finalisation of such quality plans will be finalised before award.

Contractor shall furnish list of Manufacturing Quality Plans of major equipments indicating proposed inspection catagorisation indicating items that will be offered for Owner’s inspection etc and the Field Quality Plans

2.02.00 Manufacturing Quality Plan for all the major equipment will detail out their respective important components, their in-process various tests/inspection & final inspection / tests, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's Quality Control organization. The relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing are to be comprehensibly documented by Contractor.

Manufacturing Quality Plan for all major equipments/ items will be approved by owner. In these approved quality plans, Owner / Authorised representative shall identify customer hold points (CHP), test / checks which shall be carried out in presence of the Owners Engineer or his authorised representative and beyond which the work shall not proceed without consent of Owner / Authorised representative in writing. Inspection/ Test reports are to be submitted to owner as specified in final approved Manufacturing Quality Plans.

2.03.00 Field Quality Plans / Procedures for all field activities shall be submitted to

owner for review / approval. These Quality Plans / procedures will detail out, for all equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control organisation, during various stages of site activities from receipt of materials/ equipment at site.

2.04.00 The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality plans and reference documents/standards etc. will be subject to Owner's approval without which manufacture shall not proceed. These approved documents shall form a part of the contract. In these approved quality plans, Owner/Authorised representative shall identify customer hold points (CHP), test/checks which shall be carried out in presence of the Owners Engineer or his authorised representative and beyond which the work will not proceed without consent of Owner/Authorised representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and major deviations in the form of Non Conformity Report shall be referred to Owner/Authorised representative for approval and dispositioning.

2.05.00 No material shall be despatched from the manufacturer's works before the same is accepted subsequent to pre-despatch final inspection including verification of records of all previous tests/inspections by Owner's Engineer/ Authorised representative for “CHP” and “W” points marked in quality plans , and duly authorised for despatch by issuance of Material Despatch Clearance Certificate (MDCC). For items which is not under owner’s inspection the contractor shall apply for despatch clearance (MDCC) from owner by submitting their internal inspection reports and quality records

2.06.00 All materials used or supplied shall be accompanied by valid and approved materials certificates and tests and inspection report. These certificates and reports shall indicate the sheet serial numbers or other such acceptable identification numbers of the material. The material certified shall also have the identification details stamped on it.

2.07.00 Castings and forgings used for construction shall be of tested quality. Details of results of chemical analysis, heat treatment record, mechanical property test results shall be furnished.

2.08.00 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section - IX (latest edition) or other International equivalent standard acceptable to the Owner.

All brazers, welders etc. employed on any part of the contract at Contractor's/ Sub-Contractor's works or at site shall be qualified as per ASME Section-IX (latest edition) or equivalent international standard approved by the Owner. Such qualification tests shall be conducted in presence of Owner / his authorised representative or owner approved Third Party Inspection Agency(TPIA). Previously qualified WPS & PQR shall be acceptable if witnessed by owner’s approved TPIA.

For welding of pressure parts and high pressure piping coming under IBR purview, the requirements of IBR shall also be complied with.

2.09.00 All non-destructive examination (NDT) shall be carried out in accordance with LIST OF STANDARDS FOR REFERENCE as given below in this section.

The NDT operator shall be qualified as per SNT-TC-IA (of American Society of non- destructive examination). Results of NDT for the list major equipments / items identified for owner's inspection shall be properly recorded and submitted for review and approval. Other items not covered under owner's inspection, contractor shall review and approve the NDT results and such reports shall be submitted to owner in the final documentation of the items / equipments

2.10.00 All the sub-vendors proposed by the Contractor for procurement of major bought out items including castings, forgings, semi-finished and finished components/equipment list of which shall be drawn up by the Contractor and finalised with the Owner shall be subject to Owner's approval. Quality Plans of the successful vendors shall be discussed, finalised and approved by the Owner/Authorised representative and form part of the Purchase Order between the Contractor and the Vendor.

2.11.00 All the purchase specifications for the major bought-out items, list of which shall be drawn up by the Contractor and finalised with the Owner shall be furnished to the Owner for comments and subsequent approval before orders are placed.

Owner reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-vendor's quality management and control activities. The Contractor shall provide all necessary assistance to enable the Owner carry out such audit and surveillance.

Quality audit/approval of the results of tests and inspection will not prejudice the right of the Owner to reject equipment not giving the desired performance after erection and shall not in no way limit the liabilities and responsibilities of the Contractor in earning satisfactory performance of equipment as per specification.

2.12.00 Quality requirements for main equipment shall equally apply for spares and replacement items.

2.13.00 Repair/rectification procedures to be adopted to make any job acceptable shall be subject to the approval of the Owner.

2.14.00 For quality assurance of all civil works refer to the specifications for civil works.

3.00.00 **QUALITY ASSURANCE DOCUMENTS**

3.01.00 The Contractor shall be required to submit two (2) copies and two (2) sets of microfilms / CDs of the following Quality Assurance documents within three (3) weeks after despatch of the equipment:

a) Material mill test reports on components as specified by the specification.

b) The inspection plan with verification, inspection plan check points, verification sketches, if used and methods used to verify that the inspection and testing points in the inspection plan were performed satisfactorily.

c) Non-destructive examination results /reports including radiography interpretation reports.

d) Factory tests results for testing required as per applicable codes and standards referred in the specification.

e) Welder identification list listing welder's and welding operator's qualification procedure and welding identification symbols.

f) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment.

g) Stress relief time temperature charts.

h) Inspection reports duly signed by QA personnel of the Owner and Contractor for the agreed inspection hold points. During the course of inspection, the following will also be recorded :

   i) When some important repair work is involved to make the job acceptable.

   ii) The repair work remains part of the accepted product quality.

i) Letter of conformity certifying that the requirement is in compliance with finalised specification requirements.

4.00.00 **INSPECTION, TESTING AND INSPECTION CERTIFICATES**

4.01.00 The Owner’s Engineer, or his duly authorised representative and/or an outside inspection agency acting on behalf of the Owner shall have access inside the workshops, test labs, establishments at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Owner’s Engineer and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.

4.02.00 The Contractor shall give the Owner’s Engineer/ Authorized Inspector twenty one (21) days written notice for “CHP” / “W” points of any material being ready for testing by owner’ engineer / Authorized inspector. Such tests shall be to the Contractor's account except for the expenses of the Inspector. The Engineer/ Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is notified as being ready for test/inspection. If owner’s Engineer / Authorised Inspector fail to attend the inspection, next mutually convenient date for test shall be agreed with Contractor. Contractor shall, in

no case proceed with the test without owner or his authorized inspectors, unless the witnessing is officially waived and advised Contactor to proceed with the test. Contractor shall forthwith forward duly certified completed test report and a product quality certificate in six (6) copies to owner upon completion of such test.

4.03.00 The Engineer or Inspector shall within fifteen (15) days from the date of Inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract / QAP or other approved quality documents. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall confirm in writing to the Engineer/Inspector giving reasons therein, that no modifications are necessary to comply with the contract / QAP or other approved quality documents.

4.04.00 When the factory tests have been completed at the Contractor's or sub-contractor's works, the Engineer/Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests excluding the test completion date subject to submission of all certified documents related to the test, If the tests are not witnessed by the Engineer/Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Engineer/Inspector. Failure of the owner’s Engineer/Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests, or the issue of the certificates shall not bind the Owner to accept the equipment should it, on further tests after erection be found not to comply with the contract / QAP or other approved quality documents.

4.05.00 In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the owner’s Engineer/Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contract / QAP or other approved quality documents. Contractor and shall give facilities to the owner’s Engineer/ Inspector or to his authorised representative to accomplish testing.

4.06.00 To facilitate advance planning of inspection in addition to giving inspection notice as per Clause 4.02.00, the Contractor shall furnish quarterly inspection programme indicating proposed schedule dates of inspection at customer hold point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.

LIST OF STANDARDS FOR REFERENCE

a) International Standards Organisation (ISO).

b) International Electro-technical Commission (IEC).

c) American Society of Mechanical Engineers(ASME)

d) American National Standards Institute (ANSI).

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

f) American Institute of Steel Construction (AISC).

g) American Welding Society (AWS).

h) Architecture Institute of Japan (AIJ).

i) National Fire Protection Association (NFPA).

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

k) Japanese Electro-technical Committee (JEC).

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

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

n) Instrument Society of America (ISA).

o) National Electric Code (NEC).

p) Heat Exchanger Institute (HEI).

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

r) Hydraulic Institute (HIS).

s) International Electro-Technical Commission Publications.

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

u) Applicable German Standards (DIN).

v) Applicable British Standards (BS).

w) Applicable Japanese Standards (JIS).

x) Electric Power Research Institute (EPRI).

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

z) Bureau of Indian Standards Institution (BIS).

aa) Indian Electricity Rules.

bb) Indian Boiler Regulations (IBR).

cc) Indian Explosives Act.

dd) Indian Factories Act.

ee) Tariff Advisory Committee (TAC) rules.

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

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

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

ANNEXURE-I
FORMAT OF QUALITY ASSURANCE PROGRAMME

VENDOR'S LOGO , NAME & ADDRESS	MANUFACTURING QUALITY ASSURANCE PLAN	DOC NO:	XXXXX-CAL-QAP-M-0001				
	-	REV NO :	0	1	2	3	4
	ITEM :	DATE :					

CLIENT :		LOCATION :	
PROJECT :		REFERENCE PURCHASE ORDER NO. & DT :	
VENDOR :		REFERENCE APPROVED DATA SHEET :	
SUB VENDOR :		REFERENCE APPROVED DRAWING. NO. :	

ABBREVIATIONS :

QAP - QUALITY ASSURANCE PLAN,	MATL - MATERIAL,	AGENCY :
CR - CRITICAL,	APP - APPROVED,	1 - PROJECT AUTHORITY
MA - MAJOR,	DWG - DRAWING,	2 - SUPPLIER
MI - MINOR	SUPL - SUPPLIER,	3 - SUB-SUPPLIER
SPEC - SPECIFICATION,	PROC - PROCEDURE	4 - MANUFACTURER
TC - TEST CERTIFICATES		5 - THIRD PARTY INSPECTION AGENCY
P - PERFORM		
w - WITNESS		
V - VERIFY		
CHP - CUSTOMER HOLD POINT		

GENERAL REMARKS

1 THE ITEMS WHICH ARE FALLING UNDER ANY STATUTORY AUTHORITY'S (LIKE I.B.R. ETC.) SCOPE SHALL BE SUBJECTED TO THAT STATUTORY AUTHORITY'S INSPECTION CLEARENCE.

NOTES:

1. EXACT MATERIAL / PROCESS / INSPECTION / TESTS FOLLOWED BY THE MANUFACTURER SHALL BE SPECIFIED
2. EXACT REFERENCE DOCUMENT/ACCEPTANCE STANDARD SHALL BE SPECIFIED
3. IN CASE SPECIFIED ACCEPTANCE STANDARD / NORMS IS OTHER THAN NATIONAL / INTERNATIONAL STANDARDS

. STANDARD / COPY OF THE ACCEPTANCE NORMS FOLLOWED BY THE MANUFACTURER SHALL BE SUBMITTED FOR REVIEW RECORD

4 FINAL INSPECTION DOSSIER SHALL BE PREPARED BY MANUFACTURER & SHALL BE ENDORSED BY INSPECTIONTION AGENCY

	Prepared by			Checked by			Approved By		
Revision	R0	R1	R2	R0	R1	R2	R0	R1	R2
DATE									

VENDOR'S LOGO, NAME & ADDRESS	ITEM :	DOC NO:			
		REV NO :	R0	R1	R2
		DATE :			

SL NO.	DESCRIPTION	CHECKS			CATEGORY	REF DOCS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
		TYPE	METHOD	QUANTUM					P	W	V	
1	2	3	4	5	6	7	8	9	12	13	14	15
1.00												

Notes:

Prepared by				Checked by			Approved By		
Revision	R0	R1	R2	R0	R1	R2	R0	R1	R2
DATE									

ANNEXURE-II

FIELD WELDING SCHEDULE

PROJECT	:	FWS NO	:
CONTRACTOR	:	REV NO.	:
PACKAGE	:	FIELD WELDING CODE	:
SYSTEM	:	PAGE NO.	:

Sl No.	Drawing No. for Weld Locations & Identi-fication mark	Descrip-tion of parts to be welded	Material specifica -tion	Dimen-sions	Pro-cess of Weld-ing	Type of Weld	Electrode Filler Specifica -tion	WPS No.	Minimum Pre-heat Tempera-ture	Heat Treat-ment Tempe-rature [Holding Time in secs]	NDT Method Quantu m	NDT Speci-fication Number	Accep-tance Norm Ref.	Re-marks

The Field Welding Schedule should be submitted for :

- Pressure Parts
- Tanks/Vessels
- Piping
- Heavy/Important Structural Steel
- Heat Exchangers
- Bus Ducts

REQUIREMENTS OF SPARES, TOOLS & TACKLE, LUBRICANTS/OIL/CONSUMABLES

CONTENT

REQUIREMENTS OF SPARES, TOOLS & TACKLE, LUBRICANTS/OIL/CONSUMABLES

1.00.00 TOOLS & TACKLE

The Contractor shall supply with the equipment one complete set of special tools and tackle as required for the erection, assembly, dismantling & maintenance of the equipment. These special tools will also include special material handling equipment, jigs & fixtures for maintenance and calibration/ readjustment, checking & measurement aids etc. A list of such tools & tackle shall be submitted by the Bidder along with the offer. Detailed description of each tools/tackle, its function along with the equipment/part for which it is meant for and the price of each tools/tackle shall also be indicated in the offer. These tools & tackle shall be separately packed and sent to site before the first unit commissioning. The Bidder shall also ensure that these tools are not used for erection purpose.

2.00.00 SPARES

2.01.00 General

The Bidder shall indicate and include in his scope of supply all the necessary start-up, commissioning and recommended spares in addition to mandatory spares as specified elsewhere in the specification. The Owner reserves the right to buy any or all mandatory and recommended spares. The Contractor shall also state for each item of spares both mandatory and recommended, the normal expected service life.

2.01.01 All spares supplied under this contract shall be strictly interchangeable with the parts for which they are intended to replace. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site, e.g. small items shall be packed in sealed transparent plastic bags with dessicator packs as necessary.

2.01.02 Each spare part shall be clearly marked or labelled on the outside of the packing with the description. When more than one spare part is packed in a single case, a general description of the contents shall be shown on the outside and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.

2.01.03 All cases, containers or other packages are liable to be opened for examination as may be considered necessary by the Engineer.

2.01.04 All mandatory spares shall be delivered to site within one to three months prior to the scheduled date of the trial operation of the plant. However, they shall not be despatched before the despatch of the associated main equipment.

2.01.05 The Bidder shall also guarantee supply of spare parts, which will be made, based on manufacturer's drawings on special order from the Purchaser for 30 years after commissioning of the plant.

2.02.00 **Recommended Spares**

2.02.01 The Contractor shall provide a list of recommended spares giving unit prices and total prices for 2 years of normal operation of the plant for spares of indigenous origin, and for 5 years of normal operation for spares of non-indigenous origin. This list shall take into consideration the mandatory spares specified elsewhere in the specification and should be a separate list.

2.02.02 The price of recommended spares will not be used for the evaluation of bids. The price of these spares shall remain valid for a period as specified elsewhere in the specification from the date of Award of the Contract. Where the recommended spares are the same as mandatory spares, the prices shall be the same. The prices of any recommended spares, which are not common with mandatory spares, shall be subject to review by the Owner, and shall be finalised after mutual discussion.

2.03.00 **Start-up Commissioning Spares**

2.03.01 Start-up commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used until the plant is handed over to the Owner shall come under this category. Said spares, properly marked, shall be supplied together with the main equipment and shall be used by the Contractor, if needed, during erection & commissioning stage. All such spares which remain unused till issuance of Taking Over Certificate by the Owner, along with an equipment-wise quantitative consumption report shall be returned to the Owner during time of handover. The list of commissioning spares to be brought by the Contractor to ensure smooth commissioning of the plant shall be subject to the Engineer's approval.

2.03.02 The Contractor shall submit a complete BBU list inclusive of recommended, mandatory, initial start-up and commissioning spares. Costs of the above spares, which are consumed before the handing-over of the plant, shall be deemed to have been included in the lump sum proposal price of the package, and the Contractor shall have no claim on this account to the Owner.

2.04.00 **Mandatory Spare Parts**

2.04.01 The Owner considers some of the spares are essential for running the equipment irrespective of whether they are included in the list of recommended spares by the Bidder as mentioned above.

Since the components involved can not be foreseen at the bidding stage, only

broad requirements of the Owner in this respect are outlined hereinafter. The bidder shall include his proposal, on the basis of this guideline, an item-wise list of all components and the quantity, unit prices & total price thereof, offered as mandatory spares for each and every equipment. This list shall be separate from the list of recommended spares and shall be used for bid evaluation purposes. Any clarification in this respect may be obtained by the Bidder at the pre-bidding stage.

2.04.02 The mandatory spares should be supplied to the Owner at least one month before the trial run. The despatch programme is subject to approval of the Owner/Consultant after award of contract.

SECTION C1-C

FUNCTIONAL/PERFORMANCE / DEMONSTRATION GUARANTEE (AS APPLICABLE)

TRIAL OPERATION, COMMISSIONING, PERFOMANCE/ DEMONSTRATION GUARANTEE TESTS AND HANDING OVER:

General clause

A) Trial Operation

i. On completion of erection of any major items along with its auxiliaries, the same shall be thoroughly inspected by the Contractor together with TSGENCO's Engineers for correctness and completeness and acceptability for Pre-Commissioning Tests. Though the TSGENCO's Engineers associate themselves with such inspection, the responsibility for declaration for correctness, completeness and acceptability shall rest with the Contractor and the pre-commissioning tests shall be carried out after such declaration. The pre-commissioning tests to be performed at site as well as necessary documentation and formats for the protocols to be signed during and after the tests shall be prepared by the Contractor taking into account relevant Indian/International! Manufacturers' standards as applicable and finalized by the TSGENCO sufficiently in advance through mutual discussions. On conclusion of satisfactory pre-commissioning tests of each individual equipment, the trial operation of each unit (total 4 units) shall start consistent with parameters of the technical specifications.

ii. The duration of trial operation shall be for 14 days during which period the unit shall run as follows:

a) Half to full load or any other load cycle mutually agreed to during which period the unit shall also run on economical load (90% of Full! Available Load) for 48 hours continuously.

b) During the above trial operation the standby auxiliary equipment shall also run for a minimum period of more than 72 hours during which period the equipment including standby equipment shall run at its rated capacity for a maximum period of 24 hrs subject to (a) above.

c) Full load continuous operation for seventy two (72) hours.

Any interruption caused by the Contractor up to 24 hours will not affect the period of 14 days trial operation indicated above. In case of such interruption occurring for more than 24 hours, the above period shall be extended correspondingly. The unit is deemed to be commissioned on successful completion of the above trial operation. Upon successful completion of trial operation, a protocol shall be signed by the both parties.

iii. A document shall be prepared on the results of trial operation. This document besides recording of the details of the various observations .during the trial run will also include the date of start and finish of the trial operation and will be signed by the representative of both the parties. The document of the trial operation shall have log sheets and all adjustments, repairs, interruptions etc., shall be recorded therein.

iv. The readiness of the unit for the trial operation shall be intimated by written notice to TSGENCO. After receipt of such notice and a consent within 15 days from TSGENCO, if the trial operation could not be performed or could not be completed due to any reasons not attributable to the Contractor, the Contractor shall be absolved of the responsibility for the delay and the plant shall be deemed to have been taken over by the TSGENCO at the end of 60 days after the Contractor's notifications of readiness of the same. In case TSGENCO does not reply within 15

days from contractors notification of readiness of Trial Operation, the responsibility of insurance of plant and equipment shall pass on to TSGENCO.

v. The trial operation shall be carried out in compliance with relevant manufacturers standards and/or relevant Indian / International standards and manufacturers operation directions before starting them.

vi. Defects which are minor in nature and do not endanger the safe operation of the plant, shall not be considered as reasons for not taking over the plant by the TSGENCO. These defects shall be listed in the above mentioned documents and shall be rectified by the Contractor in accordance with the agreement made in this respect.

B) PERFORMANCE / DEMOSTRATION GUARANTEE TESTS AND HANDING OVER:

i. TSGENCO shall provisionally take over the Unit upon completion of Trial Operation conducted as per clause 9 (A) above, acceptable to the TSGENCO. Contractor may apply to TSGENCO for Final Taking Over Certificate by notice enclosing the Protocol, referred to in clause 9 (A) above, and test results, after successful completion of Performance Guarantee Tests. TSGENCO shall, within fourteen (14) days after the receipt of the Contractor's application:

a) Issue the Taking over Certificate to the Contractor, stating the date on which the Performance Guarantee Tests are completed in accordance with the Contract including the date of passing of the Test on Completion. The Performance Bank Guarantees shall be returned to the contractor at the end of Warranty Period.

Or

b) Reject the application, giving reasons and specifying the work required to be done by Contractor to enable the Taking Over Certificate to be issued. Contractor shall then complete such work before issuing a further notice under this section.

ii. The unit shall be taken over or deemed to have been taken over by the TSGENCO when the Trial Operation is completed or TSGENCO utilises the facilities for generation of power (incl. Infirm Power) whichever is earlier and the responsibility of Insurance will get transferred to the Owner.

iii. Commercial operation shall begin from the date of successful completion of the trial operation as in 9(A) above or taking over by TSGENCO, whichever is earlier.

1.0.0 <u>Specific Clause:</u>

Demonstration / Functional guarantee tests of elevator shall be carried out at site as follows

A. Rated capacity of the elevator.
B. Travel and hoist Speed of the elevator.
C. Accurate positioning of the elevator.
D. Over Load test as per IS.

SECTION C1-D

QUALITY ASSURANCE

ANNEXURE-III
QUALITY ASSURANCE PLAN

	MANUFACTURING QUALITY PLAN FOR=M/S vendor	PROJECT: PACKAGE: ITEM: ELEVATOR BHEL REF. NO.:	Q.P/FQP. NO & REV: DATE:1 PAGE: 1of 4 JOB NO:

1	2	3	4	5	6	7	8	9	10				11
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD		AGENCY			REMARKS
									D	VE	M	B	
A. Boughtout Items :													
1	Raw materials, Round Hexagon & Structurals. Type : EN-8/EN-8D to EN-9,B and En-24	A: Chemical Composition	Major	Analysis	Sample	IS/BS : 970	IS/BS : 970	O.S.L/ T.C		V	V	V	
		B: Mechanical Properties	Major	Hardness	Sample	IS/BS : 970	IS/BS : 970	QA REG.		V	V	V	
		C: Dimensional Checks	Major	Measurement	100%	DRG.	DRG.	D.I.R/Q.C.R		V	w	V	
2	Raw material Rounds, En-8, EN-9, EN-24	Crack Detection	Major	Ultrasonic testing	100%	ASTM-388	ASTM -388	QA/FMT/03		V	W	V	
3	Casting : a. C.I. Graded Castings	A: Chemical Composition	Major	Analysis	Sample	IS-vendor DRG	AS PER DRG.	S.T.C	√	V	V	V	
		B: Mechanical Properties	Major	Hardness on traction sheave	Sample	vendor-DRG IS : 210	vendor-DRG IS : 210	S.T.C	√	V	V	V	
		C: Dimensional Checks	Major	Measurement	Sample	vendor-DRG	vendor-DRG	QA/FMT/02		-	W	-	
		D: Blow Holes	Major	Visual	100%	—	-	QA/REG		-	W	-	
4	Suppliers Item :												
	a. Manufactured Items	Dimensional Check	Major	Measurement	100%	vendor/DRG.	vendor/DRG.	D.I.R		-	W	-	
	b. Moldings Rubber Items (ABSORBER)	A: Dimensional Checks	Major	Measurement	100%	vendor-DRG.	vendor/DRG.	QA/FMT/02		-	W	-	
		B: Hardness	Major	Compression Test	Sample	vendor-DRG.	vendor-DRG.	QA/FMT/02		-	W	-	
	c. Springs (Buffer)	A: Dimensional Check	Major	Measurement	100%	vendor-DRG.	vendor-DRG.	QA/FMT/02		-	W	-	
		B: Spring Constant compression.	Major	Compression	Sample	vendor-DRG.	vendor-DRG.	S.T.C	√	V	V	V	
	d. Guide Rail.	A.Chemical Test.	Major	Analysis	Sample	vendor- DRG	vendor -DRG	S. T.C	√	V	V	V	
		B. Dimension check.	Major	Measurement	Sample	vendor-DRG.	vendor-DRG.	QA/FMT/02		V	W	V	
	e. Wire rope	A: Dimensional Check	Major	Measurement of O.D/ Const.	Sample	IS/2365 &	IS/2365 &	QA/FMT/02		-	W	-	
		B: Mechanical Properties.	Major	Measurement	Correlate S.T.C	IS : 2266	IS : 2266	S.T.C	√	V	V	V	

*V= Verification as appropriat. *M= Manufacturer/Sub contractor.
*W=Witness , *VE= Manufacturer/ sub contractor Vendor.
*S.T.C= Supplier Test Certificate, *B =BHEL/Nominated inspection agency.
*O.S.L = Out Side Lab, *D.I.R=Daily inspection register.
*R.Q.C = Rvendoript Quality Control (vendor) . *P =Perform.
*Q.C.R = Qua;ity Control Register (vendor) . *T.C. = Test Certificate,
*D.I.R = Daily inspection register. * D = Documents.
*U.E.R. =Ultra Sonic Examinitation Record .

MANUFACTURER SEAL AND SIGN | CONTRACTOR SIGN AND SEAL . | NAME & SIGN OF APPROVING AUTHORITY & SEAL

1	2	3	4	5	6	7	8	9	10				11
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD		AGENCY			RMARKS
									D	VE	M	B	
	f. Power & control (PVC)cable	a- FRLS ,	Major	Electrical	Sampling	IS - 694	IS - 694	S.T.C	√	V	V	V	
		b- Insulation resistance.	do	do	do	do	do	do	√	V	V	V	
5	Raw material for motor. (1) Enameled wire.	a) Dimension Check	Major	Measurement	Sample	vendor -STD	vendor -STD	D.I.R		V	W	V	
		b) High voltage test	Major	Elect.	One Sample each roll	IS:4800	IS:4800	D.I.R		V	W	V	
	(2) Copper base (Flat)	Chemical check	Major	Analysis	Sample	Cu=min 99.5%	Cu=min 99.5%	O.S.L / T.C		V	V	V	
6	Finished Manufactured Components	Plating thickness control	Major	Measurement	Sample	vendor-STD.	vendor-STD.	vendor-STD		V	W	V	
B. Inspection During mfg.													
1	Machine Shop :	A: Dimensional Check	Major	Measurement	100%	vendor-DRG.	vendor-DRG.	QA/FMT/01		-	W	-	
		B: Crack detection Motor bodies	Major	D.P. Test	100%	vendor-STD.	vendor-STD.	-		-	W	-	
		C: Surface check	Major	Visual	100%	vendor-STD.	vendor-STD.	-		-	W	-	
2	Fabrication Shop :	Dimensional Checks of critical items	Major	Measurement	100%	vendor-DRG.	vendor-DRG.	Q.C.R		-	W	-	
		Welding	minor	Visual	Sampling	do	do	.		.	W	.	Welding by approved welder
C. Assembly Inspection.		A- Back lash of gears& Maching	Major	Measurement	100%	vendor	vendor	QA/FMT/11		V	W	-	
1	Winding gear.	contact.				INSP NORMS	INSP NORMS						
		B- Vibration .	Major	Measurement	100%	vendor	vendor	do		V	W	-	
						INSP NORMS	INSP NORMS						
		C- Noise level.	Major	Measurement	100%	vendor	vendor	do		V	W	-	
						INSP NORMS	INSP NORMS						
		D- Visual .	Oil leckage	Visual	100%	vendor	vendor	do		V	W	-	
						INSP NORMS	INSP NORMS						

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***Q.C.R = Qua;ity Control Register (vendor) . *T.C. = Test Certificate,**
***D.I.R = Daily inspection register. *D = Documents.**
***U.E.R. =Ultra Sonic Examinitation Record .**

MANUFACTURER SEAL AND SIGN

CONTRACTOR SIGN AND SEAL .

NAME & SIGN OF APPROVING AUTHORITY & SEAL /HPGCIL

1	2	3	4	5	6	7	8	9	10				11
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD		AGENCY			REMARKS
									D	VE	M	B	
2	Motor Assembly :	A-Winding Insulation test.	Major	High Volt. Test	100%	I S :325-96 1.5 KV for 5 SEC	I S :325-96 1.5 KV for 5 SEC.	D.I.R QA/FMT/13		V	W	V	
		B-Insulation Resistance	Major	Measurement	100%	> 10 mega ohms	> 10 mega ohms	Test report		V	W	V	
		C-Motor testing for elect. Pmt.	Major	Elect.	100%	IS : 325	IS : 325	Test report		V	W	V	
		D-Vibration measurement & noise lev	Major	Measurement	100%	vendor - Norms	vendor -Norms	Test report		V	W	.	
3	Speed Governor Assembly :	Tripping speed Easy Run test	Major	Function Check	100%	I S : 9878 LCH -112	I S : 9878 LCH - 112	T.C IN Pant.		V	W	V	
4	Controller Assembly / VVVF Unit.	1. Visual Inspection	Major	Visual	100%	vendor Norms	vendor Norms	T.C		V	W	V	
		2. Electrical Checks (Routine Test).	do	Electrical	100%	do	do	do		V	W	V	
		3. Functional Checks	do	Function	100%	do	do	do		V	W	V	
		4. Pretreatment in seven tank for sheet & paint thickness.	Major	Measurement + Visual	Sampling	do	do	vendor - FMT.		V	W	V	

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MANUFACTURER SEAL AND SIGN

CONTRACTOR SIGN AND SEAL.

NAME & SIGN OF APPROVING AUTHIRITY & SEAL.

1	2	3	4	5	6	7	8	9	10				11
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD		AGENCY			REMARKS
									D	VE	M	B	
5	Mechanical assembly :	Cage assembly .	Major	Measurement	100%	Appd. L/o DRG. vendor-INSP. Norms	Appd. L/o DRG. vendor-INSP. Norms	QA/FMT/15		V	W	V	
6	Painting	Parts & Components	Major Major	Cross Hatch Test Powder Coating Thickness Test	Sampling Sampling	vendor-INSP. Norms vendor-INSP. Norms	vendor-INSP. Norms vendor-INSP. Norms	QA / REG. QA / REG.		V V	W W	V V	
6	Electrical Assembly	1- Break assembly .	Minor	Function check	Sampling	vendor- NORMS	vendor - NORMS	TC		V	W	V	

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MANUFACTURER SEAL AND SIGN

CONTRACTOR SIGN AND SEAL.

NAME & SIGN OF APPROVING AUTHORITY & SEAL

SECTION C1-E

PAINTING SPECIFICATION

TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

1.00.00 INTENT OF SPECIFICATION

1.01.00 This specification addresses the requirements of all labour, material, and appliances necessary with reference to preparations for lining / painting, application as well as finishing of all lining / painting for all mechanical and electrical equipment, piping and valves, structures etc. included under the scope of this Package.

1.02.00 The Bidder shall furnish and apply all lining, primers including wash primers if required, under-coats, finish coats and colour bands as described hereinafter or necessary to complete the work in all respects.

2.00.00 CODES & STANDARDS

2.01.00 The Bidder shall follow relevant Indian and International Standards wherever applicable in cleaning of surface, selection of lining material / paints and their application. The entire work shall conform to the following standards / specifications (latest revision or as specified).

a) SSPC SP 10 / NACE 2 /	:	Near White Blast Cleaning
b) SSPC PA 2	:	Measurement of dry film Coating Thickness with magnetic gauges.
c) ASTM D 4541	:	Method for pull off strength using portable Adhesion Tester.
d) NACE RP 0274 – 2004	:	High-Voltage Electrical Inspection of Pipeline Coatings
e) NACE SP 0188 – 2006	:	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

f)	NACE RP 0169 – 2002	:	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
g)	AWWA C 210 – 2007	:	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
h)	IS 3589:2001 Annexure B	:	Steel Pipes for Water and Sewage Specification.
i)	AWWA C222-2000	:	Polyurethane Coating for the Interior and Exterior of Steel Water Pipe and Fittings.
j)	IS 13213 : 2000	:	Polyurethane Full Gloss Enamel (Two pack)

3.00.00 GENERAL REQUIREMENTS

3.01.00 The steel surface preparation prior to actual commencement of coating shall conform to SSPC SP 10 / NACE 2 / Sa2½ (near white metal) with sand blasting.

3.02.00 The contractor shall submit a detailed written description in the form of a manual covering coating equipment, procedures, materials inspection test, and repair etc. to Owner/Consultant for approval.

3.03.00 The contractor shall also provide copies of test reports from NABL approved laboratory (like National Test House, Kolkata) in support of the paint/primer materials to be used shall conform to the specification requirement.

3.04.00 The contractor shall also provide certificates from paint/primer manufacturer mentioning the batch numbers, date of manufacture and shelf life etc. of the materials to be used. In addition to that Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) shall also be submitted prior to commencement of supply of material and field application.

3.05.00 Paint/coating application work at site shall be done either by paint manufacturer or by their authorized applicator. The authorized applicator shall have proper training & certification from manufacturer. Applicator shall possess all the necessary specialized equipment and manpower experienced in similar job.

3.06.00 Applied coating shall be tested for dry film thickness, holiday (electrical inspection for continuity) and adhesion as per relevant standard such as SSPC PA 2, NACE RP 0274 and ASTM D 4541.

3.07.00 If necessary, the material may be heated and applied by airless spray / plural component spray system.

3.08.00 Manufacturer's specific recommendation, if any, shall be followed during application of lining / paints.

3.09.00 In areas where there is danger of spotting automobiles or other finally finished equipment or building by wind borne particles from paint spraying, a Purchaser approved method shall be adopted.

3.10.00 The colour scheme of the entire Plant, covered under this specification shall be approved by the Purchaser in advance before application.

3.11.00 All indoor and outdoor piping, insulated as well as uninsulated will have approved colour bands painted on the pipes at conspicuous places throughout the system, as approved by Purchaser.

3.12.00 Inside surfaces of vessels / tanks shall be protected by anticorrosive paints or rubber lining as required / specified elsewhere in the specification. External surfaces of all vessels / tanks shall be protected by anti corrosive painting.

3.13.00 For vessels / tanks requiring lining and epoxy painting all inside surface shall be blast cleaned using non-siliceous abrasive after usual wire brushing.

3.14.00 Natural rubber lining shall be provided on the inside of vessels / tanks as required / specified elsewhere in the specification, in three layers resulting in a total thickness not less than 4.5 mm.

3.15.00 Surface hardness of rubber lining shall be 65 +/- 5 deg. A (shore).

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

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

3.18.00 Suitable warnings, indicating the special care that must be taken with respect to these lined vessels shall be stenciled on their outside surface with the letters at least 12 mm high.

3.19.00 All insulated piping shall have aluminium sheet jacketing.

4.00.00 EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER

4.01.00 After erection at site, the outside surfaces of all equipment having a shop coat shall be given further priming coat and finished coats of paint as detailed in following clauses. However, if the painting system is such that the shop coat and primer coat to be applied at site are not compatible, then shop coat has to be removed from the surface of equipment before application of primer coat with prior blasting.

All factory finished paints shall be touched up at site as required.

All uninsulated piping shall be finished with final paintings after use of proper wash primer and primer. Aluminium sheet jacketed piping need not be painted. Colour bands of Purchaser's approved shade shall however be applied on jacketed piping near walls or partitions, at all junctions, near valves and all other places as instructed by the Purchaser. All structures shall be painted with approved paint.

4.02.00 Surface Preparation

4.02.01 Unless mentioned otherwise, all rust and mill scale shall be removed by blasting to Sa 2-1/2 Swiss Standard before applying the primer.

4.02.02 Special care shall be taken to remove grease and oil by means of suitable solvents like Trichloroethylene or Carbon Tetrachloride.

4.02.03 The minimum degree of surface preparations for all equipment, piping, fittings, valves, structures etc. shall be "Near White" according to Steel Structure, Painting Council-SSPC-SP-10 before application of any primer/paint.

4.03.00 Painting

4.03.01 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc. to be installed indoor shall be as follows :

a) Surface preparation shall be done either manually or by any other approved method.

b) Primer Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based zinc phosphate.

c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based paint pigmented with Titanium Dioxide.

d) Top Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber paint of approved shade and colour with glossy finish.

e) Total DFT of paint system shall not be less than 150 microns.

4.03.02 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc to be installed **outdoor** shall be as follows :

a) Surface preparation shall be done by means of sand blasting, which shall conform to Sa 2-1/2 Swiss Standard.

b) Primer Coat shall consist of one coat (minimum DFT of 100 microns) of epoxy resin based zinc phosphate primer.

c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 100 microns) epoxy resin based paint pigmented with Titanium Dioxide.

d) Top Coat shall consist of one coat (minimum DFT of 75 microns) of epoxy paint of approved shade and colour with glossy finish. Additional one coat (minimum DFT of 25 microns) of Finish Coat of polyurethane shall be provided.

e) Total DFT of paint system shall not be less than 300 microns.

4.03.03 Specification for application of paints for external surfaces protection of steel pipes and fittings which are **buried underground / laid inside a hume pipe & or submerged Under Water and laid under Pipe Trenches** (in road/rail/pipe or trench crossings) shall be as follows :

The no. of coats and DFT specified above is minimum. However to achieve above specified DFT, no of coats can be increased as per paint manufacture's recommendation.

External surface of the pipe, fittings, specialties etc. handling raw water/clarified water/filter water shall be painted with one coat of two part chemically cured polyurethane primer of min 50 micron dry film thickness followed by three or maximum four coats of two part solvent less polyurethane to build up coating of dry film thickness of 2000 micron including primer coat.

4.03.04 Specification for application of paints for **internal surface protection of large diameter pipes** (sizes above 600 mm NB and above) if any, shall be as follows :

a) All internal surfaces of steel pipes, fittings, specialties etc. buried underground or located within pipe trenches shall be given epoxy coating to protect them from (except for drinking water service, where the compatible painting shall be so selected to meet relevant quality standards) corrosion.

b) Internal surface of the pipe should be coated with one coat of two part epoxy primer with not less than 50 micron DFT (dry film thickness) followed by two part polyamide cured solvent less epoxy.

c) The minimum dry film thickness (DFT) of internal lining shall be 600 micron.

4.03.05 Specification for application of paints for protection of **internal surfaces of DM Water Storage Tank(s)** shall be as follows :

a) Primer - One coat of epoxy primer containing high level of Zinc Phosphate anticorrosive pigment. Total Dry Film Thickness (DFT) of primer shall not be less than 125 microns.

b) Finish Paint - Three (3) coats Polyamine HB Epoxy Paint. Total Dry Film Thickness (DFT) of finish paint shall not be less than 125 microns per coat.

c) Total thickness of primer and paint should not be less than 500 microns.

4.03.06 All motors, local push button stations, cable racks, structures used for supports etc. are to be painted with acid proof paint.

4.03.07 The following surfaces shall not be painted - stainless steel, galvanized steel, aluminum, copper, brass, bronze and other nonferrous materials.

4.03.08 No painting or filler shall be applied until all repairs, hydrostatic tests and final shop inspection are completed.

The no. of coats and DFT specified above is minimum. However to achieve above specified DFT, no of coats can be increased as per paint manufacture's recommendation.

4.03.09 All machined surfaces shall have two (2) coats of water repellant grease after thorough cleaning.

5.00.00 COATING PROCEDURE AND APPLICATION

5.01.00 Surface Preparation :

Pipe shall be blast cleaned by sand. The cleanliness achieved prior to application shall be in accordance with the requirement of SSPC SP 10 / NACE 2 / Sa2½ of ISO 8501 (near white metal)

a) The blast pattern or profile depth shall be 40 to 100 micron and shall be measured by dial micrometer.

b) Before sand blasting is started or during blasting or coating, temperature of the pipe surface should be more than 3°C above dew point temperature. Blast cleaned surface should be primed within 4 hours and shall be protected from rainfall or surface moisture and shall not be allowed to flash rust. If the rust occurs, the surface again to be prepared by sand blasting or wire brushing.

5.02.00 Application of Epoxy Coating

a) Coating shall be applied when

i) When the pipe surface temperature shall be atleast 3°C above dew point temperature.
ii) The temperature of mixed coating material and the pipe at the time of application shall not be lower than 10°C or greater that 50°C.

b) Material preparation shall be in accordance with manufacturer's recommendations.

c) Application of epoxy coating system :

The epoxy coating system shall be applied as per recommendation of the manufacturer and shall be applied by airless spray / plural component spray machine. For more than one coat, the second shall be applied with the time limits as recommended by the manufacturer.

5.03.00 Application of PU Coating

a) PU coating shall be applied when the pipe surface temperature atleast 3°C above dew point temperature (when R.H is more than 85%).

b) Material preparation and application shall be done as per manufacturer recommendation.

6.00.00 TEST REQUIREMENTS :

6.01.00 Measurement of dry film thickness

Measurement of dry film thickness of coating : Coating thickness shall be in the range of ±20% and as per SSPC PA 2.

6.01.01 Apparatus / Instrument:-

The instrument used for dry film thickness may be Type 1 pull of gauges or Type 2 electronic gauges.

6.01.02 Procedures:-

a) Number of measurements:
For 100 square feet (9.29 square meters), five (5) spots per test area (each spot is 3.8 cm) in diameter. Three gauge readings per spot (average becomes the spot measurement).

b) If the structure is less than 300 square feet, each 100 square feet should be measured.

c) If the structure is between 300 and 1000 sq ft, select 3 random 100 square feet test areas and measure.

d) For structure exceeding 1000 square feet, select 3 random 100 square feet testing areas for the first 1000 sq ft and select 1 random 100 square feet testing area for each additional 1000 square feet

e) Coating thickness Tolerance: Individual reading taken to get a representative measurement for the spot are unrestricted (usually low or high readings are discarded). Spot measurements (the average of 3 gauge readings) must be within 80% of the minimum thickness and 120% of the maximum thickness. Area measurement must be within specified range.

6.02.00 Electrical Inspection (Holiday) Test

6.02.01 All the coated / lined pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio visual signaling device to indicate any faults, holes, breaks or conductive particles in the protective coating.

6.02.02 The applied output voltage of holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20m/min. The edge effect shall be ignored. Excessive voltage shall be avoided as it tends to induce holiday in the coated surface thereby giving erroneous readings.

6.02.03 While selecting test voltages, consideration should be given to the tolerance on coating thickness and voltage should be selected on the basis of maximum coating thickness likely to be encountered during testing of a particular pipe.

The testing voltage shall be calculated by using following formula. (as per NACE 0274 : 2004)

Testing Voltage V = 7900 $\sqrt{T}$ ± 10 percent where T is the average coating thickness in mm.

6.02.04 Any audio visual sound or spark leads to indicate pinhole, break or conductive particle.

6.03.00 Adhesion Pull off Test :

After holiday the coated surface is subjected to adhesion pull off test as per ASTMD 4541.

6.03.01 Apparatus / Instrument: Adhesion tester consists of three basic components:

A hand wheel, a black column containing a dragging indicator pin and scale in the middle and a base containing three legs and a pulling “Jaw” at the bottom and also dollies.

6.03.02 Prepare the test surface :

Once test area is selected, test area shall be free of grease, oil, dirt, water. The area should be flat surfaces and large enough to accommodate the specified number of replicate test.

6.03.03 Prepare Dolly (Test Pull Stub) :

The dolly is a round, two sided aluminium fixture. Both sides of the dolly looks same, however, one side sloped on top surface while flat on bottom surface. As the surface of the dolly is polished aluminium, roughen the same using a coarse sand paper.

6.03.04 Select an adhesive:

Use araldite, a 100% solid epoxy adhesive. This adhesive requires at least 24 hours at room temperature to cure.

6.03.05 Attach the dolly to the surface.

a) Using a wooden stick, apply an even layer of adhesive to the entire contact surface area of the dolly.

b) Carefully remove the excessive adhesive by using a cotton swab. Allow the adhesive to fully cure before performing the adhesion test.

c) Attach the dolly to the coated surface and gently push downward to displace any excessive adhesive.

d) Push the dolly inward against the surface, then apply tape across the head of the dolly.

6.03.06 Adhesion Test Procedure

a) Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.

b) Slide the jaw completely under the head of the dolly. Position the three legs of the instruments so that they are sitting flat on the coated surface.

c) Slide the dragging indicator pin on the black column to zero by pushing it downward.

d) Firmly hold the base of the instrument in one hand and rotate the handwheel clockwise to raise the jaw of the device that is attached to the head of the dolly. The dragging indicator pin will move upward on the black column as the force is increased and will hold the reading. Apply the tension using a moderate speed. Continue to increase the tension on the head of the dolly until (a) the minimum PSI/MPa/Kg/cm² required by project specification is exceeded and the test is discontinued, (b) the maximum PSI/MPa/Kg/cm² of adhesion tester has been achieved and dolly is still attached, (c) The force applied by the adhesion tester causes the dolly to dislodge.

e) Read the scale and record the adhesion value.

6.04.00 Coating Repair

Defective Coating shall be repaired in accordance with the following subsections.

6.04.01 Surface Preparation:

Accessible areas of pipe requiring coating repairs shall be cleaned to remove debris and damaged coating using surface grinders or other means. The adjacent coating shall be feathered by sanding, grinding or other method. Accumulated debris shall be removed by blowing with contaminant free air or wiping with clean rags.

6.04.02 Areas not accessible for coating repair such as interior surfaces of small diameter pipe shall be reprocessed and recoated.

6.04.03 Coating Application :

The coating system shall be applied to the prepared areas in accordance with procedure.

6.04.04 Repair Inspection :

Repaired portion shall be electrically inspected using a holiday detector.

6.05.00 Welded Field Joints

6.05.01 Preparation :

The weld joints shall be cleaned so as to be free from mud, oil, grease, welding flux, weld spatter and other foreign contaminants. The cleaned metal surfaces of the weld joint shall then be blasted or abraded using rotary abrading pads. The adjacent liquid Epoxy / PU coating shall be feathered by abrading the coating surface for a distance of 25 mm.

6.05.02 Electrical Inspection :

After curing the coating system applied to the welding joints shall be holiday tested. Any holidays indicated by the detector shall be marked with chalk to identify the area of repair.

7.00.00 INFORMATION/DATA REQUIRED

The Bidder shall submit complete list of paints and primers proposed, giving detail information, such as, chemical composition, drying time etc. and also unit rates for application of each type of paint along with supply shall be furnished.

SECTION- C2

TECHNICAL SPECIFICATION
(Electrical Portion)

TECHNICAL SPECIFICATION

FOR

ELEVATOR

(ELECTRICAL PORTION)

1.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:**

a) Services and equipment as per "Electrical Scope between BHEL and Vendor".
b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
d) Electrical load requirement for **Elevator**
e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
g) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
h) Motor shall meet minimum requirement of motor specification.
i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
j) Cable BOQ worked out based on routing of cable listing provided by the vendor for " both end equipment in vendor's scope"shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer "Electrical Scope between BHEL and Vendor".

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

3.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.

3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 List of enclosures :

a) Electrical scope between BHEL & vendor (Annexure –I)
b) Standard BHEL speicification for motors.
c) Datasheets(A&C) & quality plan for motors.
d) Electrical Load data format (Annexure –II)
e) BHEL cable listing format (Annexure –III)
f) Expalnatory notes for cable routing

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE: ELEVATORS
SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT: 4X270MW BHADRADRI TPS

S. NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	Isolating Switch	Vendor	Vendor	BHEL will provide two number 415 V (3ph, 4W) supply feeder only up to isolating switches for elevators. Any other voltage level (AC/DC) required will be derived by the vendor. Motor starter shall be part of elevator control panel.
2	Power cables, control cables, screened control cables and any special cables (if required) between equipment supplied by vendor.	Vendor	Vendor	Cable from supply feeder to isolating switch shall be in BHEL scope.
3	Cabling material (cable trays, accessories, cable tray supporting system, conduits etc).	Vendor	Vendor	
4	Equipment Earthing	Vendor	Vendor	All equipment metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL.
5	Motors	Vendor	Vendor	
6	Cable glands and lugs for equipment supplied by vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power & control cables.
7	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
8	Equipment layout drawings	Vendor	-	
9	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

1.0	Design ambient temperature	:	50 °C
2.0	Maximum acceptable kW rating of LV motor	:	160KW *
3.0	Installation (Indoors/ Outdoors)	:	As required
4.0	Details of supply system		
	a) Rated voltage (with variation)	:	415V ± 10%
	b) Rated frequency (with variation)	:	50 Hz + 3 % to - 5%
	c) Combined voltage & freq. variation	:	10% (sum of absolute values)
	d) System fault level at rated voltage	:	50 kA for 1 sec
	e) Short time rating for terminal boxes		
	○ 110 kW and above (Breaker Controlled)	:	50 KA for 0.20 sec..
	○ Below 110 kW (Contactor Controlled)	:	50 KA protected by HRC fuse
	f) LV System grounding	:	Solidly
5.0	Class of insulation	:	Class 'F', with temp rise limited to class B.
6.0	Minimum voltage for starting (As percentage of rated voltage)	:	(a) 85% below 110KW (b) 80% from 110KW to 160KW (c) 85% above 160KW to 1000KW (d) 80% from 1001 KW to 4000KW (e) 75% > 4000KW
7.0	Power cables data	:	Shall be given during detailed engg.
8.0	Earth Conductor Size & Material	:	As per attached Datasheet of Earthing.
9.0	Space heater supply	:	240 V, 1¢, 50 Hz (for motors above 30 Kw)
10.0	Rating up to which Single phase motor	:	Acceptable below 0.20 kW
11.0	Locked rotor current		
	a) Limit as percentage of FLC	:	As per IS 12615*
12.0	Flame-proof motor		
	a) Enclosure suitable (As per IS: 2148)	:	As per requirement
	b) Classification of Hazardous area (As per IS: 5572 part-I)	:	As per requirement
13.0	Makes	:	BHEL/ Customer approval
14.0	Paint shade	:	Shall be given during detailed engg
15.0	Degree Of protection for motor/ terminal box	:	IP 54/ IP 55

* Continuous duty LT motors up to 160 KW Output rating (at 50 deg.C ambient temperature), shall be High efficiency (IE2) as per IEC: 60034-30/ IS:12615

16.0 TESTING

16.1 Type Tests

For LT Motors above 55kW, type test reports for type tests as per IS: 325/ IS: 12615 conducted on equipment similar to those proposed to be supplied and carried out within last five years from the date of bid opening shall be submitted. However, if such reports are not available, one motor of each type shall be subjected to type tests for free of cost.

16.2 Routine Tests

All motors shall be subjected to routine tests as per IS: 325/ IS: 12615 in the presence of customer or customer representative.

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.
2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.
3. The field properties shall be as under:
    a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
    b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
    f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
    g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.
4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).
5. The cables shall be described as per the scheme listed below:

A	NN	A	NNN
|	|	|	|
Cable Voltage Code (see B below)	No. of cores (e.g. 01,03,3H, 07)	Cable code (See C below)	Cable size (e.g. 035,185,2.5, 0.5)

(A) SYSTEM VOLTAGE CODES:
(ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V
(dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

(B) CABLE VOLTAGE CODES:
A = 11KV (Power cables)

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

B = 6.6KV (Power cables)
C = 3.3KV (Power cables)
D = 1.1KV (LV & DC system power & control cables)
E = 0.6KV (0.5 sq. mm. Control cables)

(C) CABLE CODES

PVC Copper

A = Armoured FRLS	B = Armoured Non-FRLS
C = unarmoured FRLS	D = Unarmoured Non-FRLS

PVC Aluminium

E = Armoured FRLS	F = Armoured Non-FRLS
G = unarmoured FRLS	H = Unarmoured Non-FRLS

XLPE Copper

J = Armoured FRLS	K = Armoured Non-FRLS
L = unarmoured FRLS	M = Unarmoured Non-FRLS

XLPE Aluminium

N = Armoured FRLS	P = Armoured Non-FRLS
Q = unarmoured FRLS	R = Unarmoured Non-FRLS

S = FIRE SURVIVAL CABLES
T = TOUGH RUBBER SHEATH
U = OVERALL SCREENED
V = PAIRED OVERALL SCREENED
W = PAIRED INDIVIDUAL SCREENED
Y = COMPENSATING CABLES
I = PRE-FABRICATED CABLES
Z = JELLY FILLED CABLES

CABLE SCHEDULE FORMAT **ANNEXURE III**

UNITCABLENO	FROM	TO	PURPOSE	CABLE SCOPE (BHEL PEM/ VENDOR)	REMARKS	CABLESIZE	PATHCABLENO	TENTATIVE CABLE LENGTH

1.0 General

a) This part of the specification describes the general requirements for the Variable Voltage Variable frequency Drives, herein referred to as AC Drives, for use with standard IEC design AC squirrel cage induction motors. The nominal values, the standard documents and the drive's minimum performance are defined in this part. **To avoid any mismatch between the motor and its control equipment, the AC Drive shall be capable of auto adjustment by automatic measurement of the motor parameters with/without motor rotation.**

b) Inverter construction and related devices:

Construction shall be divided in 3 broad sections. Section one converts AC Supply into DC supply. Section 2 Converts and controls DC supply into AC Supply with regulation. Section 3 shall be used for braking action of the motor and Dynamic Braking Unit (DBU) can be inbuilt or external depending upon the drive capacity. VVVF can be used in open loop (without external speed feed back) like in Travel motions or close loop (With external speed feed back) like in Hoist motions. Like all other electronic / electric devices VVVF drives are also protected by MCB / MCCB / Fuses. VVVF drives are sensitive to temperature and hence drive internal as well as external cooling fans are provided.

c) Programming of VVVF Drives.

VVVF drives shall be programmable and for that purpose detachable digital Operator display unit shall be supplied along with the VVVF having required buttons for setting the user constant, functions etc. The VVVF drive is to be fine tuned by matching the motor parameters and setting the parameters on full load.

d) VVVF drives shall be connected with power supply and these drives generate their own low voltage control supply. Potential free contacts shall be connected to this control supply and few programmable control terminals. Starting / stopping / set speeds operations of VVVF drive shall be achieved by above control connection.

e) VVVF shall give smooth control over acceleration and deceleration making the motion jerk free and using Variable voltage variable frequency limits the inrush current to the squirrel cage motors. VVVF provides controlled torque to the motor due to which elevator operations are jerk free.

1.1 Experience

The Frequency Converter Manufacturer shall have adequate experience in frequency converter manufacturing and have adequate business volume in order to provide credibility in his commitments and a capability of long term support.

1.2 Local support

The Supplier shall have a permanent representative office with a trained and skilled support staff, in the country where the goods are delivered, in order to prove his commitment for local support and to provide a channel for communication.

The engineers employed by the Supplier's regional office shall be certified by the Manufacturer and provide start-up service including physical inspection of the drive, connected wiring and final adjustments, to ensure that the AC Drive meets the required performance.

The Supplier shall be able to give basic drives training to the Customer's engineers, preferably on the site. The training shall, as a minimum, include system concepts and basic troubleshooting.

2.0 Basic requirements for the AC Drives

2.1 General requirements

The AC Drive shall comply with National (country of origin) and International standards and the recommendations for electrical industrial control devices (IEC, EN, UL, NFC, and VDE).

The AC Drive shall be of the most modern design, yet user friendly and be simple to install commission and maintain. The AC Drive shall be able to start and control the speed of a standard squirrel cage induction AC motor. The AC Drives shall be: CE marked, conforming to European Low Voltage (73/23/CEE and 93/68/CEE) and EMC (89/336/CEE) Directives, UL/CSA marked according to UL 508C.

The AC Drives have to be built to comply with the IEC standards.

The AC Drive shall be a digitally controlled drive, using, at least, the Pulse Width Modulation (PWM) with flux vector control open loop (for travel) and closed loop (for hoist). It shall have diodes / thyristors in rectifier and IGBT's in the inverter section in their entire power range, and it shall have the following minimum specifications.

Rated Input Voltages	380V to 480V (-10% to +10% variation), three-phase
Rated Input Frequency	50Hz +5 % to - 5%
Output Voltage	0 – Input voltage, three-phase
Output Frequency Range	0 to 400 Hz
Acceleration / Deceleration Time	0.01 – 999s, adjustable, linear, with S, with U or customised shapes
Overload capability (Constant Torque)	150% of nominal current for 1min.
Operating ambient Temperature	-10°C up to 50°C(shall be de-rated suitably if not rated at 50°C)
Storage ambient Temperature	-25°C up to 70 °C

Maximum operating altitude	1000 m without de-rating, 1000…3000 (shall be de-rated suitably)
Max. Relative Humidity	95 %, without condensation and dripping water.
Main Protections	Over current, short circuit between phase, short circuit between phase and ground, input phase loss, output phase loss, motor overload, over speed, over voltage, under voltage, drive over temperature

The AC Drive shall be able to give a 100 % output current continuously in the above specified conditions. In order to ensure that the drive can provide the required output current in the specified ambient conditions, the Manufacturer shall inform the required de-rating, if the ambient temperature given in the project-specific specification is higher than rated ambient of the drive or if the installation altitude is more than 1000 m above the sea level. The de-rating factor shall be specified so that neither the lifetime of the AC Drive nor the unit's performance, overload capability included, nor the reliability of the AC Drive shall suffer.

Suitable encoder shall be provided for main hoist motion.

3.0 User interface

3.1 General

The user interface shall be identical throughout the power range and type to avoid confusion amongst the users and need for training in several different units.

3.2 Inputs and outputs

A. At least, the following standard Inputs and Outputs shall be provided, to be used in interface with the control system:

Analogue Inputs : 1 x Programmable differential voltage input ± 10V,
1 x Programmable current input 0(4) - 20mA
1 x Programmable voltage input 0 – 10V

Analogue Output : 1 x Programmable analogue outputs 0(4) - 20mA or 0 – 10V

Logic inputs : 6 x Programmable logic Inputs isolated from the mains

Relay Outputs : 2 x Programmable Digital outputs with a changeover dry contact

All the control terminals shall be clearly marked.

B. At least, it shall be possible to assigned the following functions to the I/Os:

Analogue input	**Analogue outputs**
Speed reference Summing reference	Motor current Motor frequency Motor torque Motor power
Logic input	**Relay or logic outputs (open collector)**
Forward Reverse Jog Preset speeds Reference switching Ramp switching Parameter sets selection Fast stop Freewheel stop + speed - speed External fault	Ready Drive running High speed attained Drive fault Frequency threshold attained Motor thermal state attained Torque or current limitation attained Brake control

3.4 Programming terminal

A. The AC drive shall have a keypad /display for programming and controlling purposes. An IP54 or IP65 remote mounting shall be possible at a distance of 10m.

B. Password protection shall be provided to avoid unauthorized tampering with the set parameters.

C. The programming terminal shall be able to display the commercial reference of the AC drive and of the options, the software version, the serial number

D. Direct keypad entry shall be provided to observe the following actual parameters. Any one of the following parameters or actual values shall be selected to be always displayed:

i) Input Voltage
ii) Input Frequency
iii) Output Frequency
iv) Output Power
v) Output Current
vi) Motor Speed

The following parameters shall always be displayed during normal operation:-

i) Drive Status

The following drive control functions at least shall be available from the keypad:-

i) Run
ii) Stop
iii) Local / Remote selection.
iv) Forward/Reverse (if function enabled)
v) Accelerate
vi) Decelerate
vii) Parameter setting

3.5 Application programming

The AC Drive shall be designed for both simple and the most complicated applications, yet it shall be user friendly. It shall be possible to reset the parameter settings back to the original factory settings through the keypad.

3.6 PC Tools

The AC Drive Supplier shall have Windows based PC software available for monitoring and controlling the AC Drives, and the software shall be offered as an option. The software shall be supplied with the necessary hardware and a provision for connecting a PC with the AC Drives. It shall be possible to set and modify parameters, control the drive, read actual values and make trend analysis using the software.

4.0 Software features

A. Restart

In the event of a fault trip due to over voltage, over current or loss of analogue signal, the AC DRIVE shall be programmable to attempt an automatic restart. For safety reasons, the maximum number of attempts shall be within a selectable time. If the fault does not clear after the attempts, the drive shall lock out.

B. Brake logic control

The AC Drive shall have a built-in function to control a mechanical brake in order to move the load in a smooth and safe way. The brake logic control shall be adapted to the different movements: hoisting, travel, orientation.

5. Preferred makes:

Schneider Electric, L&T-YASKAWA, Siemens, ABB, Allen Bradley (Rockwell Automation).

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

1.0 INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0 CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement ofr rotating electrical machnines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechnical vibration of rotatinf electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0 DESIGN REQUIREMENTS

3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3 Starting Requirements

3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.

ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)

iii) Motors for coal conveyor and coal crusher application shall be suitable fro three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be sutable fro mimimum 20,000 starts during the life time of the motor

3.4 **Running Requirements**

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

3.5 **Stress During bus Transfer**

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechnical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.

4.0 **CONSTRUCTIONAL FEATURES**

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy

4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.

Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled

4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.

4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.

4.5 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.

4.6 In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.

4.7 **Terminals and Terminal Boxes**

4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.

Unless otherwise statedin Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".

4.7.2 Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.

4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or V W & V respectively.

4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.

4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.

4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.

4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.

4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.

4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.

4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

4.9 **General**

4.9.1 Motors provided for similar drives shall be interchangeable.

4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.

4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.

4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.

4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

4.9.6 Name plate with all particulars as per IS: 325 shall be provided

4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0 **INSPECTION AND TESTING**

5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.

5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.

5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.

5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0 **DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT**

a) OGA drawing showing the position of terminal boxes, earthing connections etc.
b) Arrangement drawing of terminal boxes.
c) Characteristic curves:
(*To be given for motor above 55 kW unless otherwise specified in Data Sheet*).

i) Current vs. time at rated voltage and minimum starting voltage.
ii) Speed vs. time at rated voltage and minimum starting voltage.
iii) Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

S. No.	Description	Data to be filled by successful bidder
A.	**General**	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	**Design and Performance Data**	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a Voltage	
6	b Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	**Characteristic curves/ drawings** (To be enclosed for motors of rating ≥ 55KW)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

	QUALITY PLAN		**CUSTOMER : TSGENCO**			PROJECT	**4X270MW BHADRADRI TPS**		SPECIFICATION :			
						TITLE	**ELEVATOR**		NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION TITLE			
	SHEET 1 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		NOTE -1 & NOTE-3
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3
BHEL			**PARTICULARS**		**BIDDER/VENDOR**							
			NAME									
			SIGNATURE									

		QUALITY PLAN	**CUSTOMER : TSGENCO**			PROJECT	**4X270MW BHADRADRI TPS**		SPECIFICATION :			
						TITLE	**ELEVATOR**		NUMBER :			
			BIDDER/ :			QUALITY PLAN			SPECIFICATION :			
			VENDOR			NUMBER PED-506-00-Q-006, REV-01			TITLE :			
		SHEET 2 OF 2	SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	

NOTES:

1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON

2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.

3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.

Legends for Inspection agency

1. BHEL/CUSTOMER
2. VENDOR (MOTOR MANUFACTURER)
3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)

P. PERFORM
W. WITNESS
V. VERIFY

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

ANNEXURE-I

LIST OF MAKES

1.0.0 Bidder to note that Make of various items shall subject to approval of BHEL / Customer during detail engineering stage without any commercial implication at contract stage.

ANNEXURE-II

MANDATORY SPARES

ANNEXURE-II
List of Mandatory Spares for elevator.

Capacity and type of elevator for TG building, Service building and administrative building are same. Hence one set of spares common for TG building, service building and admin building elevator shall be provided.

Sl. No.	DESCRIPTION	Qty. for Two Unit	Remark
1	Guide roller of each type	20% of total population or 2 Nos. of each type whichever is higher	As Applicable
2	Contactors	2 Nos of each type & rating	
3	Auxilliary, Control transformer	1 No. of each type & ratings	
4	Auxillary Relay	1 No. of each type & ratings	
5	Resistors (if applicable)	3 Nos. of each type & rating	
6	Fuses /MCB/ (as applicable)	2 Nos. of each type and rating.	
7	Limit Switches	3 Nos. of each type	
8	Push Button	3 Nos. of each type	
9	Switches of each type	2 Nos. of each type & rating	
10	Bearings	2 Nos. of each type & rating.	
11	Worm Gear Spares		
	a. O rings	4 sets	
	b. Sealing Ring of each type	4 sets	
12	Spares of Brake		
	a. Fan	2 sets of each type	
	b. Magnetic coil	3 sets of each type	
	c. Brake disc	2 Nos. of each type	
	d. Brake pad	2 Nos. of each type	
13	Floor indicator display unit	1 Nos. of each type	

ANNEXURE-III

LIST OF TOOLS AND TACKLES

ANNEXURE-III

List of Tools & tackles for elevator.

Sl. No.	DESCRIPTION	Qty.	Remarks
1	Spanner of all sizes required for maintenance		
2	Adjustable Spanner		
3	Allen Key set all sizes required for maintenance		
4	Screw driver set		
5	Cutting plier		
6	Grease gun		
7	Nose plier		
8	Grip plier		
9	Hook spanner		
10	Box spanner		
11	Oil can		
12	Measurement Taps		
13	Paint brush 1/4,1/2,3/4 inch		
14	Line tester		
15	Multimeter		
16	Soldering iron		
17	Torch Light		
18	Knife cutter		
19	Steel rule		
20	Wire Striper		
21	Tube Spanner Combination		
22	Hammer 1/2 Kg		
23	Dial rench		
24	Other tools if any (Please specify)		

ANNEXURE-IV

Drawing document submission schedule

S.N0.	Description	Schedule
1	First submission of dwg/ docs as per MDL	Within two (2) weeks from placement of LOI.
2	Every repeat submission	Within one (1) week.
3	Response time by BHEL	Within three (3) weeks after receiving of drawing.

Note:

1.0 The above are the minimum quantity of drawings/documents required. The exact requirement shall be informed to the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL.

2.0 Bidder to note that BHEL reserves the right for drawing/document submission through web based Document Management System. Bidder would be provided access to the DMS for drawing/document approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7.
- Internet speed – 2 mbps (Minimum preferred).
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked.
- Vendor's internal proxy setting should not block DMS application's link (http://124.124.36.198/wrenchwebaccess/login.aspx).

ANNEXURE-1

DISTRIBUTION SCHEDULE

S. No	Description	TSGENCO								Consultant			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/	SE/ Civil	SE/E&M /	DE Constr.		HYD	BTPS		
A	**Letter Of Intent or Contract Documents**	1	1	1	S	1	2	2	1	1	1	1	2	
B	**Vendor Drawings**													
1.	Preliminary	1	1	1	2	1	1	2	2	12	1	-	S	
2.	Return preliminary with comments	-	-	1	2	1	1	1	1	S	1	-	1	
3.	Final and any revision thereof													
	a. Civil	1	1	6+1T	1	1	6+1T	1	-	2+1T	1	1	S	
	b. E&M	1	1	1	6+1T	1	1	6+1T	1	2+1T	1	1	S	
C.	**Design Drawings**													
1.	Preliminary													
	a. Civil	1	1	2	1	1	2	1	1	4	1	1	S	
	b. E&M	1	1	1	2	1	1	2	1	4	1	1	S	
2.	Released for construction													
	a. Civil	1	1	2	1	1	6	1	1	1	1	2	S	
	b. E&M	1	1	1	1	2	1	6	1	1	1	2	S	
3.	Return marked 'As built'													
	a. Civil	-	-	1	-	-	1	-	-	1	1	S	1	
	b. E&M	-	-	-	1	-	-	1	1	1	1	S	1	
4.	As built drawings													
	a. Civil	-	-	1+1T	-	2+1T	5+1T	-	1	1+1T	-	1	S	
	b. E&M	-	-	1	2+1T	2+1T	-	5+1T	1+1T	1+1T	-	1	S	

S. No	Description	TSGENCO								Consultant			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/	SE/ Civil	SE/E&M /	DE Constr.		HYD	BTPS		
D	Progress Report Monthly													
1.	Equipment vendor	1	1	1	2	1	1	2	1	1	1	1	S	
2.	Consultant	1	1	2	2	1	1	2	1	S	1	1	Nil	
E	Test & Inspection Reports													
1.	Equipment manufacturer													
	a. Civil	1	1	1	2	1	1	1	-	11	1	1	S	
s	b. E&M	1	1	-	2	1	-	1	1	11	1	1	S	
2.	Consultant	1	1	-	2	1	-	1	1	S	-	1	-	
F	Instruction Manuals/Data Books													
1.	Equipment manufacturer													
	a. Civil	1	1	1+1T	1	1	6+1T	1	1	2+1T	1	1	S	
	b. E&M	1	1	-	3+1T	1	-	6+1T	2	3+1T	1	1	S	
2.	Consultant	1	1	-	10+1T	1	-	15+1T	-	S	1	1	Nil	
G	Consultant	1	1	1	8+1T	1	1	2	1	1	1	1	S	
H	Design Calculations	1	1	1	8+1T	1	1	2	1	1	1	1	S	
I	Final consulting Engineering Report	1	1	1	10	1	1	2	1	S	1	1	Nil	

S – Source, T – Transparency & Soft Copy on CD,

TSGENCO : Telangana State Power Generation Corporation Limited

Director, Projects, Hyd : Director/ Projects, TSGENCO, Vidyut Soudha, Hyderabad – 500 082

ANNEXURE-V

MDL FOR ELEVATOR

S.N0.	BHEL DOC No	TITLE	PURPOSE
1	PE-V0-411-502-A101	TDS OF TG HALL ELEVATOR	A
2	PE-V0-411-502-A102	TDS OF SERVICE BUILDING ELEVATOR	A
3	PE-V0-411-502-A103	TDS OF ADMINISTRATIVE BUILDING ELEVATOR	A
4	PE-V0-411-502-A001	GA, M/C ROOM LAYOUT, SCOPE & BOM OF PASSENGER ELEVATOR (TG HALL)	A
5	PE-V0-411-502-A002	GA, M/C ROOM LAYOUT, SCOPE & BOM OF PASSENGER ELEVATOR (SERVICE BUILDING)	A
6	PE-V0-411-502-A003	GA, M/C ROOM LAYOUT, SCOPE & BOM OF PASSENGER ELEVATOR (ADMINISTRATIVE BUILDING)	A
7	PE-V0-411-502-A003	MQP FOR BUILDING ELEVATOR (Common for TG hall, Service building and Administrative building)	A
8	PE-V0-411-502-A004	O&M MANUAL FOR BUILDING ELEVATOR (Common for TG hall, Service building and Administrative building)	I

A= APPROVAL
I= INFORMATION

ANNEXURE-VI

Check List for Operation & Maintenance Manual

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipments.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				

6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

ANNEXURE-VII

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)

PROJECT ENGINEERING MANAGEMENT, POWER SECTOR

BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. ‘No smoking’ signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.

11. Following preservatives/preservation methods can be used depending upon type of equipment

    a. Rust preventive fluid (RPF)

    b. Rust protective paints

    c. Tarpaulin covers, in case of outdoor storage

    d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

    - Ingress of moisture and corrosion damages.
    - Damage to protective coating.
    - Open ends in pipes, vessels and equipment -
        - In case any open ends are noticed, same shall be capped.

2. Any damages to equipment / materials.

    - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
    - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere**. (C)

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.

ii **Semi-closed storage**. (S)

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.

iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.

The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H_2SO_4)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	**Description of the equipment**	**Type of Storage**	**Check for**	**Remarks**
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

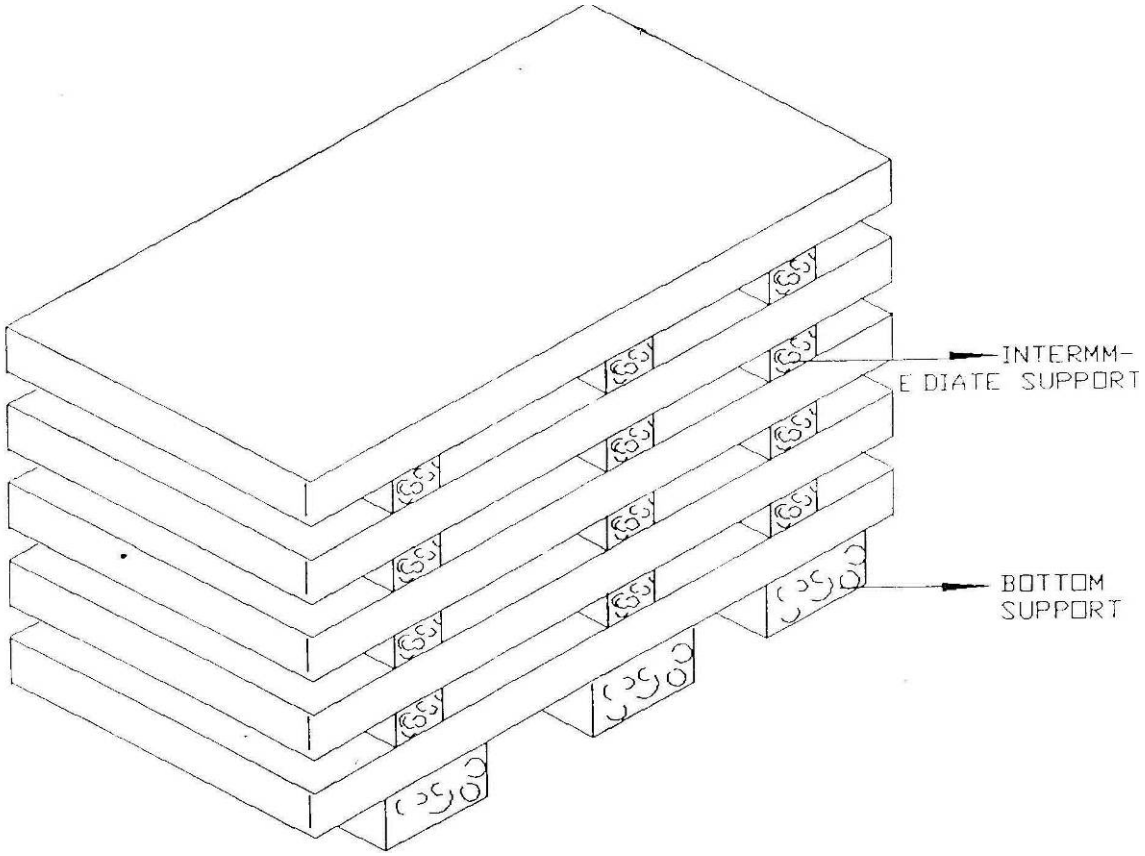

Figure – 1 – PLATE STACKING ARRANGEMENT

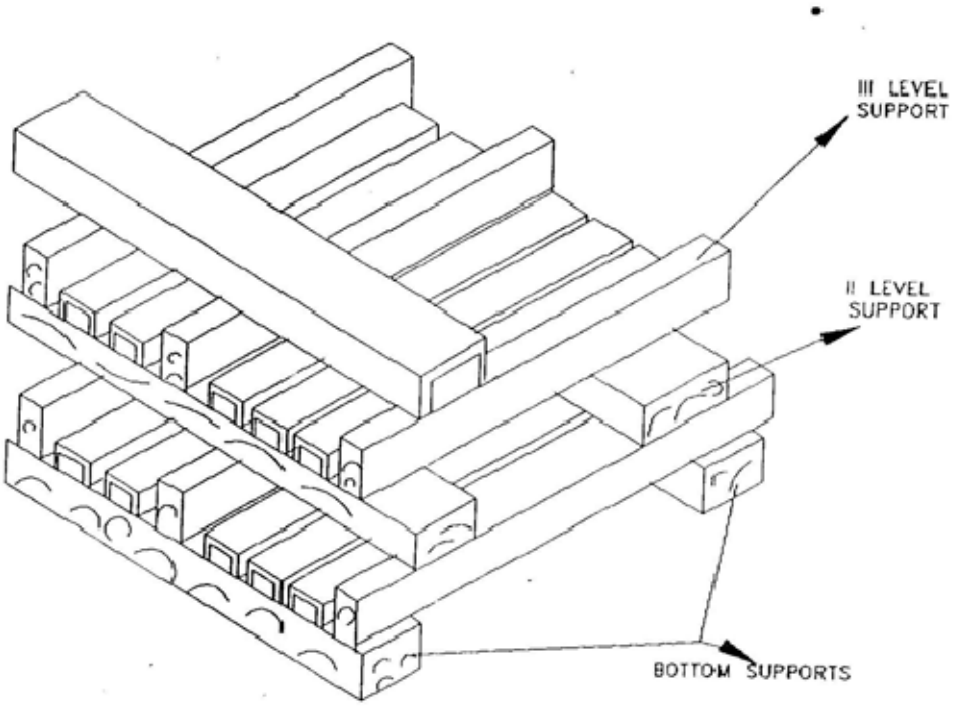

Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT

CIVIL INPUT DETAILS.

Project: 4 X 270 MW BHADRADRI TPS.
Job No. 411
PACKAGE: ELEVATORS

Details of Elevator shaft well dimension as per IS: 14665 (all parts) is tabulated below.

Building / Location	**No. of elevator**	**Capacity of elevator (KG)**	**Type of elevator (Conventional / panoramic)**	**Type of service (Passenger Elevator / Passenger cum goods elevator / Goods cum passenger elevator)**	**Elevator shaft dimension (inside clear space over plaster) as per IS :14665 (C X D) mm**		**Elevator shaft construction with**	**Remarks**
					C	D		
TG Building.	3 Nos.	884	Conventional	Passenger Elevator	2500 (ENTRANCE)	1900	Clay Brick or concrete with plastered and white washed shaft walls from inside.	As per manufacturer's recommendation, fly ash brick not to be used.
Service Building	1 No.	884	Conventional	Passenger Elevator	2500 (ENTRANCE)	1900		
Administrative building	1 No.	884	Conventional	Passenger Elevator	2500 (ENTRANCE)	1900		

Note:

1. Min height above M/c Room slab till M/c Room ceiling (below secondary roof beams) shall be 4.00 m.
2. Please note that Lift Well/Shaft dimensions furnished are as per IS 14665, Part-I. Further bidder to note that TOC of pit for all elevators shall be (-)1.6 m. RCC pedestals for buffers for car and counter weight(in pit) & traction machine (in machine room) and cutouts & pockets in machine room shall be furnished after finalization of order.
3. Shaft construction shall be done with RCC or clay bricks (230 mm thk) only, which shall be confirmed during contract stage.

Volume – III

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BIDDER HAS TO SUBMIT ONLY FOLLOWING DOCUMENTS ALONG WITH THE OFFER, FOR TECHNICAL EVALUATION OF THE BID:-

1) SCHEDULE OF TECHNICAL DEVIATION (IF ANY)
   OR
   'NO DEVIATION CERTIFICATE' – Clearly mentioning that bidder has considered 'No - Deviation' from the technical specification provided by BHEL.

2) SIGNED AND STAMPED COPY OF COMPLIANCE CUM CONFIRMATION CERTIFICATE.

3) Unpriced format, duly mentioned 'Quoted' against each Sl.no/ clause no.

4) Signed and stamped copy of :
   a) "Specific-Electrical Equipment Specification for elevator.
   b) "Electrical Scope between BHEL and Vendor" sheet.
   c) Compliance to /duly filled "Electrical Load Data" sheet.

Note 1:- Any other standard document/ details furnished by the bidder i.e. Data sheet / GA Drawing/ QAP etc. shall not be taken in to consideration for evaluation.

Note 2:- Bidder to note that if the bidder does not submit the documents mentioned in Sl. No. 1.0 to 4.0 along with their offer then their offer is liable to be rejected.

LOAD TITLE	RATING (KW)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TG HALL ELEVATOR																		
ELEVATOR MOTOR		16.5	S	3	0	D	S	-	C		TG HALL Elevator Machine room (1 No. for Unit # 1 1 No. common for unit # 2&3 1 No. for unit # 4)							
2 T A/C FOR TG HALL M/C ROOM AND LIGHTING FOR ELEVATOR M/C ROOM & SHAFT AND MAINTENANCE AND INSTALLATION REQUIREMENT.		7	S	3	0	D	S	-	C		TG HALL Elevator Machine room (1 No. for Unit # 1 1 No. common for unit # 2&3 1 No. for unit # 4)							
SERVICE BUILDING ELEVATOR																		
ELEVATOR MOTOR		16.5	S	1	0	D	S	-	C		Service Building Elevator Machine room							
2 T A/C FOR SERVICE BUILDING ELEVATOR M/C ROOM AND LIGHTING FOR ELEVATOR M/C ROOM & SHAFT AND MAINTENANCE AND INSTALLATION REQUIREMENT		7	S	1	0	D	S	-	C		Service Building Elevator Machine room							
ADMINISTRATIVE BUILDING ELEVATOR																		
ELEVATOR MOTOR		16.5	S	1	0	D	S	-	C		Admin Building Elevator Machine room							
2 T A/C FOR Admin BUILDING ELEVATOR M/C ROOM AND LIGHTING FOR ELEVATOR M/C ROOM & SHAFT AND MAINTENANCE AND INSTALLATION REQUIREMENT		7	S	1	0	D	S	-	C		Admin Building Elevator Machine room							

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)

2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (DC): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

BHEL	**LOAD DATA (ELECTRICAL)**	JOB NO.	411	ORIGINATING AGENCY		PEM (ELECTRICAL)
		PROJECT TITLE	4X270MW BHADRADRI TPP.	NAME		DATA FILLED UP ON
		SYSTEM / S	ELEVATOR	SIGN.		DATA ENTERED ON
		DEPTT. / SECTION	MAUX / MH	SHEET 1 OF 2	REV. 00	DE'S SIGN. & DATE

LOAD TITLE	RATING (KW)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Note:

1) **No other single phase or 3 phase supply shall be provided for elevator erection / operation etc**.
2) **Only two (3 phase) supply feeders per elevator shall be provided, one feeder shall be dedicated to elevator motor and other 3 phase supply feeder shall be provided by BHEL for air conditioner, machine room and shaft lighting and maintenance / installation requirement. Bidder to consider CT for stepping down the voltage as per their requirement.**

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)

2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (DC): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

	LOAD DATA (ELECTRICAL)	JOB NO.	411	ORIGINATING AGENCY		PEM (ELECTRICAL)	
		PROJECT TITLE	4X270MW BHADRADRI TPP.	NAME		DATA FILLED UP ON	
		SYSTEM / S	ELEVATOR	SIGN.		DATA ENTERED ON	
		DEPTT. / SECTION	MAUX / MH	SHEET 2 OF 2	REV. 00	DE'S SIGN. & DATE	

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificates (every sheet) and furnishes same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those resolved as per 'Schedule of Deviations', with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates / Inspection records etc. This is within the contracted price with extra implications to BHEL after award of the contract.

d) All drawings / data-sheets / calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself. Prices for special tools & tackles, if any, shall also be included in the base price.

g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

h) Guarantee for plant /equipment shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account.

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) That the bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section/Clause /Page No.	Statement of the referred clause	Clarification Required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

DEVIATION SHEET (COST OF WITHDRAWL)

PROJECT:- 4X270 MW BHADRADRI TPS.

PACKAGE:- ELEVATOR

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

	4 X 270 MW BHADRADRI TPS				**Rev 00**		**20/03/2015**	
	PRICE SCHEDULE - ELEVATOR PACKAGE							
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**ED**	**CST / VAT**	**FREIGHT**	**E&C Charges**	**Service tax on E & C**	**Total**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9 (3 to 8)**
1.0.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing,painting, supply of mechanical, electrical equipments and control system & equipments with minor civil works, delivery duly packed at project site including unloading, storage and handling at site, scaffolding supply, erection and commissioning, trial run at site, and handing over to the customer in line with drawings/ documents/ test procedures approved by BHEL/Customer for**TG building, three (3) no. 884 Kg capacity passenger elevator (conventional type) with speed 1 m/s, Four (4) nos. of landings including ground and 21.0 M (last landing elevation) Total travel, Service building, one (1) no. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, Six (6) nos. of landings including ground and 21.25.0 M (last landing elevation) Total travel,** **Administrative building, one (1) no. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, three (3) nos. of landings including ground and 8.50 M (last landing elevation) Total travel, complete** with all accessories**, Erection and commissioning spares, mandatory spares (Annexure-II) and one set of Maintenace Tools and Tackles (Annexure-IV)** for the total scope defined for 4**x270 MW BHADRADRI TPS. FOR ELEVATOR** packgae as per technical specification PE-TS-411-502-A001 taking into account all clarifications, confirmations and agreements till date.							
NOTES	***Bidder to note that total price indicated above at 1.0.0 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and considering all terms and conditions agreed.***							
a	***Any item not included in the price quoted above and shown separately will not be taken cognizance of and the offer shall be liable for rejection.***							
b	***Total Lumpsum price in column-9 should match with summation of total prices as in [Column (7) of 1.0.0 of Annexure- I + Column (11) of A of Annexure - II + Column (6) of 1.0.0 of Annexure- III + Column (10)) of A of Annexure- IV.***							
c	***As per cl. no. 3.0 of GCC Rev-06, Total erection & commissioning charges including service tax should be minimum 20% (or as specified in NIT) of the total quoted package price (excluding mandatory spares but including all taxes and freight), failing which the break-up ofprices shall be adjusted accordingly for ordering.***							
d	***All deviations should be marked in Cost of withdrawal sheet (Annexure-V) only. Deviations marked elsewhere other than schedule of deviation shall not be taken into cognizance.***							
	Bidder's / bidder's representative signature				Company seal			

		PRICE SCHEDULE	**Rev 00**		**20/03/2015**	
		4 X 270 MW BHADRADRI TPS				
		ANNEURE-I **MAIN SUPPLY - PRICE SCHEDULE FOR ELEVATOR PACKAGE**				
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**ED**	**CST / VAT**	**FREIGHT**	**Total**
1	**2**	**3**	**4**	**5**	**6**	**7 (3 to 6)**
1.0.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing,painting, supply of mechanical, electrical equipments and control system & equipments with delivery duly packed at project site including scaffolding supply in line with technical specification for **TG building, three (3) no. 884 Kg capacity passenger elevator (conventional type) with speed 1 m/s, Four (4) nos. of landings including ground and 21.0 M (last landing elevation) Total travel, Service building, one (1) no. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, Six (6) nos. of landings including ground and 21.25.0 M (last landing elevation) Total travel, Administrative building, one (1) no. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, three (3) nos. of landings including ground and 8.50 M (last landing elevation) Total travel, complete** with all accessories**, Erection and commissioning spares, and one set of Maintenace Tools and Tackles** for the total scope defined for 4**x270 MW BHADRADRI TPS. FOR ELEVATOR** packgae as per technical specification PE-TS-411-502-A001 taking into account all clarifications, confirmations and agreements till date.					
NOTE	1) Any variation in total travel length and no of landing due to change in travel length and no of landing will be adjusted based on unit rates arrived from 3.1.0 and 3.2.0 below.					
2.0.0	**Break Up Prices**					
2.1.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing,painting, supply of mechanical, electrical equipments and control system & equipments with delivery duly packed at project site including including scaffolding supply in line with technical specification for **TG building, Three (3) nos. 884 Kg capacity passenger elevator (conventional type) with speed 1 m/s, Four (4) nos. of landings including ground and 21.0 M (last landing elevation) Total travel, complete** with all accessories for the total scope defined as per technical specification **PE-TS-411-502-A001, including E&C spares** taking into account all clarifications, confirmations and agreements till date.	60 % of total supply price at column 7 of 1.0.0				

		PRICE SCHEDULE		**Rev 00**		**20/03/2015**
		4 X 270 MW BHADRADRI TPS				
		ANNEURE-I **MAIN SUPPLY - PRICE SCHEDULE FOR ELEVATOR PACKAGE**				
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**ED**	**CST / VAT**	**FREIGHT**	**Total**
1	**2**	**3**	**4**	**5**	**6**	**7 (3 to 6)**
2.2.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing,painting, supply of mechanical, electrical equipments and control system & equipments with delivery duly packed at project site including including scaffolding supply in line with technical specification for **Service building, one (1) nos. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, Six (6) nos. of landings including ground and 21.25 M (last landing elevation) Total travel, complete** with all accessories for the total scope defined as per technical specification **PE-TS-411-502-A001, including E&C spares** taking into account all clarifications, confirmations and agreements till date.	20 % of total supply price at column 7 of 1.0.0				
2.3.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing,painting, supply of mechanical, electrical equipments and control system & equipments with delivery duly packed at project site including including scaffolding supply in line with technical specification for **Administrative building, one (1) nos. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, three (3) nos. of landings including ground and 8.50 M (last landing elevation) Total travel, complete** with all accessories for the total scope defined as per technical specification **PE-TS-411-502-A001, including E&C spares** taking into account all clarifications, confirmations and agreements till date.	19 % of total supply price at column 7 of 1.0.0				
2.4.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for supply/delivery duly packed at project site including freight , unloading, storage and handling at site, and handing over to the customer in line with drawings/ documents approved by BHEL/Customer for one set of **Maintenance tools and Tackles common for all elevators. (as per Annexure -IV, Bidder to indicate the applicable Tools & tackle)**	1 % of total supply price at column 7 of 1.0.0				
2.5.0	Lumpsum firm prices of any other item under 1.0.0 inclusive of all taxes, duties and other levies as applicable (please specify)					
3.0.0	**Unit rates for scope adjustment (both for (+) ve and (-) Ve variation)**					

		PRICE SCHEDULE	**Rev 00**		**20/03/2015**	
		4 X 270 MW BHADRADRI TPS				
		ANNEURE-I **MAIN SUPPLY - PRICE SCHEDULE FOR ELEVATOR PACKAGE**				
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**ED**	**CST / VAT**	**FREIGHT**	**Total**
1	**2**	**3**	**4**	**5**	**6**	**7 (3 to 6)**
3.1.0	Additional/ takeout price for supply of one landing inclusive of all taxes, duties and other levies as applicable					
3.2.0	Additional/takeout price for per meter increase/decrease in total rise/travel inclusive of all taxes, duties and other levies as applicable					
	Bidder's / bidder's representative signature				Company seal	

4x270 MW BHADRADRI TPS.

ANNEXURE II
PRICE SCHEDULE FOR MANDATORY SPARES OF ELEVATOR PACKAGE

List of Mandatory spares (Common for TG building, Service building and administraive building elevators)

Sl.no	Description	Qty.	Unit	Unit Ex-works price	Total ex-works price	ED	CST	FREIGHT	INSURANCE	FOR SITE
1	2	3	4	5	6	7	8	9	10	11
1	Guide roller of each type	20% of total population or 2 Nos. of each type whichever is higher								
2	Contactors	2 Nos of each type & rating	Nos.							
3	Auxilliary, Control transformer	1 No. of each type & ratings	Nos.							
4	Auxillary Relay	1 No. of each type & ratings	Nos.							
5	Resistors (if applicable)	3 Nos. of each type & rating	Nos.							
6	Fuses /MCB/ (as applicable)	2 Nos. of each type and	Nos.							
7	Limit Switches	3 Nos. of each type	Nos.							
8	Push Button	3 Nos. of each type	Nos.							
9	Switches of each type	2 Nos. of each type & rating	Nos.							
10	Bearings	2 Nos. of each type & rating.	Nos.							
11	Worm Gear Spares									
	a. O rings	4 sets	set							
	b. Sealing Ring of each type	4 sets	set							
12	Spares of Brake									
	a. Fan	2 sets of each type	set							
	b. Magnetic coil	3 sets of each type	set							
	c. Brake disc	2 Nos. of each type	Nos.							
	d. Brake pad	2 Nos. of each type	Nos.							
13	Floor indicator display unit	1 Nos. of each type	Nos.							
A	**Total price of Mandatory Spares**									

Notes

a)	Unless stated otherwise, a 'set' means item or sub-items required for each type/ size, range of assembly/ sub- assembly required for complete replacement in one equipment system; it is further intended that the assembly/ sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in marinating two different sets of spares to be used for subject assembly/ sub assembly, these shall be considered as different type of assembly/ sub assembly.
b)	Wherever quantity has been specified as percentage(%), the quantity of mandatory spares to be provided by the vendor shall be the specified percentage (%) of total population required to meet the specification requirements. In case the quantity of mandatory spares so calculated happens to be in fraction, the same shall be rounded off to next higher whole number.
c)	Wherever the quantities have been indicated for each type, size, thickness, material, radius , range etc, these shall cover all the items supplied and installed and the breakup of these shall be furnished by the vendor during detail engineering.
d)	In case spares indicated in the list are not applcable to the particular design offered by the bidder, the bidder should offer spares applicable to the offered design with quantities genaerally in line with the approach followed in the above list.
e	Wherever bidder has indicated an item as not applicable, the same will have to be supplied free of cost, incase it is found applicable during detail engineering.

	PRICE SCHEDULE	**Rev 00**		**20/03/2015**	
	4 X 270 MW BHADRADRI TPS				
	ANNEURE-III **ERECTION & COMMISIONING - PRICE SCHEDULE FOR ELEVATOR PACKAGE**				
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**E&C Charges**	**Service tax on E & C**	**Total**
1	**2**	**3**	**4**	**5**	**6 (3 to 5)**
1.0.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for erection and commissioning, trial run at site, and handing over to the customer in line with drawings/ documents/ test procedures approved by BHEL/Customer for TG building, three (3) no. 884 Kg capacity passenger elevator (conventional type) with speed 1 m/s, Four (4) nos. of landings including ground and 21.0 M (last landing elevation) Total travel, Service building, one (1) no. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, Six (6) nos. of landings including ground and 21.25.0 M (last landing elevation) Total travel, Administrative building, one (1) no. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, three (3) nos. of landings including ground and 8.50 M (last landing elevation) Total travel, complete with all accessories, for the total scope defined for 4x270 MW BHADRADRI TPS. FOR ELEVATOR packgae as per technical specification PE-TS-411-502-A001 taking into account all clarifications, confirmations and agreements till date.				
NOTE	**1) Any variation in total travel length and no of landing due to change in travel length and no of landing will be adjusted based on unit rates arrived from 3.1.0 and 3.2.0 below.**				
	2) As per cl. no. 3.0 of GCC Rev-06, Total erection & commissioning charges including service tax should be minimum 20% (or as specified in NIT) of the total quoted package price (excluding mandatory spares but including all taxes and freight), failing which the break-up ofprices shall be adjusted accordingly for ordering.				
2.0.0	**Break Up Prices**				
2.1.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for erection and commissioning, trial run at site, and handing over to the customer in line with drawings/ documents/ test procedures approved by BHEL/Customer for **TG building, Three (3) nos. 884 Kg capacity passenger elevator (conventional type) with speed 1 m/s, Four (4) nos. of landings including ground and 21.0 M (last landing elevation) Total travel, complete** with all accessories for the total scope defined as per technical specification **PE-TS-411-502-A001,** taking into account all clarifications, confirmations and agreements till date.				
2.2.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for erection and commissioning, trial run at site, and handing over to the customer in line with drawings/ documents/ test procedures approved by BHEL/Customer for **Service building, one (1) nos. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, Six (6) nos. of landings including ground and 21.25 M (last landing elevation) Total travel, complete** with all accessories for the total scope defined as per technical specification **PE-TS-411-502-A001,** taking into account all clarifications, confirmations and agreements till date.				
2.3.0	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for erection and commissioning, trial run at site, and handing over to the customer in line with drawings/ documents/ test procedures approved by BHEL/Customer for **Administrative building, one (1) nos. 884 Kg capacity passenger elevator (conventional type) with speed 1.0 m/s, three (3) nos. of landings including ground and 8.50 M (last landing elevation) Total travel, complete** with all accessories for the total scope defined as per technical specification **PE-TS-411-502-A001,** taking into account all clarifications, confirmations and agreements till date.				
3.0.0	**Unit rates for scope adjustment (both for (+) ve and (-) Ve variation)**				
3.1.0	Additional/ takeout price for Erection & commissioning of one landing inclusive of all taxes, duties and other levies as applicable				

		PRICE SCHEDULE	**Rev 00**		**20/03/2015**
		4 X 270 MW BHADRADRI TPS			
		ANNEURE-III **ERECTION & COMMISIONING - PRICE SCHEDULE FOR ELEVATOR PACKAGE**			
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**E&C Charges**	**Service tax on E & C**	**Total**
1	**2**	**3**	**4**	**5**	**6 (3 to 5)**
3.2.0	Additional/takeout price for per meter increase/decrease in total rise/travel inclusive of all taxes, duties and other levies as applicable				
	Bidder's / bidder's representative signature		Company seal		

ANNEXURE-IV

4x270 MW BHADRADRI TPS

ANNEXURE-IV

List of Maintenance Tools & Tackles for Elevator package

Sl.no	Description	Qty.	Unit	Unit Ex-works price	Total ex-works price	ED	CST	FREIGHT	FOR SITE
1	2	3	4	5	6	7	8	9	10
1	Spanner of all sizes required for maintennce								
2	Adjustable Spanner								
3	Allen Key set all sizes required for maintennce								
4	Screw driver set								
5	Cutting plier								
6	Grease gun								
7	Nose plier								
8	Grip plier								
9	Hook spanner								
10	Box spanner								
11	Oil can								
12	Measurement Taps								
13	Paint brush 1/4,1/2,3/4 inch								
14	Line tester								
15	Multimeter								
16	Soldering iron								
17	Torch Light								
18	Knife cutter								
19	Steel rule								
20	Wire Striper								
21	Tube Spanner Combination								
22	Hammer 1/2 Kg								
23	Dial rench								
24	Other tools if any (Please specify)								
A	**Totao price for maintenanace tools & tackles**								

DEVIATION SHEET (COST OF WITHDRAWL)

ANNEXURE-V

PROJECT:- 4X270 MW BHADRADRI TPS.

PACKAGE:- ELEVATOR

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									
PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE									
NAME				DESIGNATIONS		SIGN & DATE			

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of .
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.