



**TELANGANA STATE POWER GENERATION  
CORPORATION LTD.**

**1 X 800 MW KOTHAGUDEM TPP FGD**

**TECHNICAL SPECIFICATION  
FOR  
FGD CONTROL BUILDING ELEVATORS**

**SPECIFICATION NO.: PE-TS-439-502-A001**



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



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**SECTION – I**

**SPECIFIC TECHNICAL REQUIREMENTS**

**IA – Specific Technical Requirement (Mechanical)**



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**SCOPE OF ENQUIRY / INTENT OF SPECIFICATION**

- 1.1 This specification includes, but not limited to, design (i.e. preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, material selection, manufacture, fabrication, assembly, inspection, testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables, mandatory spares (if applicable) along with spares for erection, startup and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling, transportation & storage at site, in-site transportation, assembly, minor civil works, erection & commissioning, carrying out trial run at site, preparation of drawings in 3D (if applicable) and carrying out acceptance /performance guarantee/Functional/Demonstration tests at site (As applicable), training of customer/client O&M staff (if applicable) & final handing over to end customer in flawless condition for elevator package complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification, amendment & agreements till placement of order for **1 X 800 MW KOTHAGUEDEM TPP FGD in Telangana State** and necessary accessories including supply of mandatory spares, 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 Section-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.



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- 1.8 Deviations, if any, should be very clearly brought out clause by clause in the Deviation schedule enclosed with NIT; 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.



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## 1.0 Introduction

Passenger elevator shall be provided for access to various operating floors / platforms in FGD Control building for 1 X 800 MW KOTHAGUEDEM TPP FGD 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, mandatory spares, Erection & Commissioning, carrying out trial run and Acceptance / functional tests at site & final painting of Passenger Elevators for 1 X 800 MW KOTHAGUEDEM TPP FGD as listed below: -

Sl. No	Building	No of Lifts	Cap.	No of landings	Total Rise	Type	Rated Speed	Type of floor
1.	FGD Control Room Building	1 No.	680 Kg	Five (05) including ground (0M, 3.7M, 8.7M, 12.4M, 18.4M)	18.4M	Passenger Elevator Conventional Type.	1 m/s	PVC tiles

**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.



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- 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.
- 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 earthing.
- 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) Any other equipment required to meet the requirement of local statutory and regulatory body and prevailing lift etc.
- 20) Car lighting, LED along with fittings for illumination level of 100 lux.
- 21) Elevator shaft, pit cable conduit fixtures, switches 3 pin or as required by bidder during erection / maintenance purpose at every 3 m.
- 22) Mirror for the car rear panel.
- 23) Floor announcement cum music system to be provided.
- 24) Maintenance tools and tackles along with un-priced list with the offer.
- 25) Three (03) sided SS- mirror finish hand railing at suitable height.
- 26) Minor civil work including grouting as well as foundation bolt grouting as required during installation of elevator.
- 27) Bidder shall include scaffoldings required in their scope of supply for erection.



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- 28) Automatic rescue device with battery drive - Modern advanced electronic drive system of rescuing passenger trapped in an elevator shall be provided.
- 29) 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.
- 30) All steel embedment for fixing landing doors / indicators etc. to the elevator well shaft and fascia plate shall be supplied by the bidder.
- 31) Guide rails complete with supporting brackets for the car and counter weights.
- 32) 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.
- 33) Any other steel works as well as all other accessories / components not specified in the technical specification but necessary for making the elevator complete.
- 34) 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 & service, 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.
- 35) Dummy landing/s, as required in case travel between two consecutive landings is more than 11 m, shall be considered by bidder in his offer.
- 36) Any other requirement stipulated by state statutory body and prevailing local lift act requirement shall also to be included by bidder in their scope.
- 37) 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.
- 38) Mandatory Spares:

A complete unused and new set of Mandatory Spare parts shall be supplied. The items supplied shall be of the best quality and specially protected against rusting in tropical climate. The minimum requirement of mandatory spare parts is listed in Annexure –II section-IA of this specification.



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- 39) Split Air conditioner (reputed make) 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.
- 40) 1/2 Kg CO<sub>2</sub>/suitable type Fire extinguisher in bidder scope. Fixing arrangement shall be provided in Car accordingly.

**NOTES:**

- 1) Flooring for elevators shall be as per scope of supply ref cl. No. 2.0.1, Section IA of Technical Specification with MS steel frame suspended on the car frame with spring isolation element 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 :14665. Bidder shall refer the requirement mentioned elsewhere in this specification.
- 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 civil input drawings attached in the specification for the building.
- 5) Elevators pit for FGD Control Building shall be bare pit (i.e. pit without any RCC block / pedestal for buffer for CAR & CWT). Accordingly, MS structure & buffer required for elevator resting shall be provided by bidders.
- 6) All Equipment's / facilities needed for erection & commissioning shall be in bidder's scope.
- 7) 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. The circular trailing cables shall be either in accordance with IS 4289 Part-I (elastomer insulated) or IS 4289 Part II (PVC insulated). The flat type trailing cables if offered shall be in accordance with IEC 60227-6.
- 8) Make of various bought out items & QAP shall be subject to approval of BHEL / Customer during detail engineering stage without any commercial implication at contract stage.



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- 9) Bidder shall supply erection and commissioning spares as required during E&C stage without any commercial implication.
- 10) Car frame and structure (guide brackets, supports, MS Structure for buffer car & counterweight, etc) shall be painted with epoxy-based paint for all elevators.
- 11) Protection class for Elevator traction machine (elevator motor) shall be IP 55 & Protection class for door motor shall be IP 54 and main control panel shall be min IP 54 and elevator control shall be VVVF type. Push buttons, Car operating Panel, Landing Operating Panel, and other equipment shall be IP-54.
- 12) Factor of safety for rope shall be 12 (min).
- 13) All Landing door shall be fire rated for at min 2 hours or as per latest IS / as per the state statutory requirement whichever is more stringent.
- 14) Motor shall be S4 duty with insulation class F & temp rise limited to class B.
- 15) 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.
- 16) 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.
- 17) 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.
- 18) 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.
- 19) Elevator shall be provided with AC VVVF type drive control system.
- 20) The local statutory clearance approval / permit board shall be placed on lift cabin.



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### **3.0 SCOPE OF SERVICES**

Scope of services will broadly include the following: -

- 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.

### **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 & earthing at one point in machine room. Further cabling (all cables including power, control, earthing and instrumentation as per tender specification) shall be provided by the bidder.
- 4) Electrical exclusion as per separate scope sheet attached in the specification.



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## **5.0 Operation**

Elevator shall have provision to meet followings operational requirements: -

- a) Selective simplex / duplex collective (As applicable), 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) Suitable arrangement shall be provided to intimate unit control room during emergency in the form of audio-visual alarm.
- f) 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.
- g) All fixtures shall be in stainless steel face plates.
- h) Push buttons shall be fixed in the car for holding the door open for any length of time required.
- i) 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).



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## **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**

- a) All the cables except trailing cables shall be as per IS 1554-1 or IS 7098-1. The PVC outer sheath of these cables shall be flame retardant, low smoke (FRLS) type.
- b) Trailing cable:  
The circular trailing cables shall be either in accordance with IS 4289 Part-I (elastomer insulated) or IS 4289 Part II (PVC insulated). The flat type trailing cables if offered shall be in accordance with IEC 60227-6.

All wiring/ cabling between the equipments in the lift machine room and that between the machine room and equipments in the lift well and at the landings shall be wired in HDP conduits/ galvanized steel conduits to be supplied by the elevator supplier. 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 equipment including metal conduits shall be effectively earthed with 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 1.0 m/ sec (for all elevators). 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 conform 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.



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- 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, hair line finish (including landing doors of the car), flooring as indicated at scope of supply ref cl. No. 2.0.1, Section IA of Technical Specification, 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 civil contractor 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.



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- 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 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.



**1 X 800 MW KOTHAGUDEM TPP FGD**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**FGD CONTROL BUILDING ELEVATOR**

SPECIFICATION NO.: PE-TS-439-502-A001

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- 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.
- 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.
- 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.



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- 20) Bar chart, list of drawings and documents including data sheet, manual calculation, quality plan, field quality plan, PG test / functional 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) “Technical deviations” shall be clearly indicated in bidder’s offer in prescribed format only.
- 22) 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.

## CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	CODES AND STANDARDS
2.00.00	SCOPE OF WORKS
3.00.00	OPERATION AND CONTROL PHILOSOPHY
4.00.00	PERFORMANCE REQUIREMENT
5.00.00	DESIGN AND CONSTRUCTION
6.00.00	INSPECTION AND TESTING
7.00.00	DRAWINGS, DATA AND INFORMATION

## ATTACHMENTS

ANNEXURE-I	<del>GOODS CUM PASSENGER ELEVATORS FOR STEAM GENERATOR &amp; MILL AREA</del>
ANNEXURE-II	<del>GOODS CUM PASSENGER ELEVATORS FOR POWER HOUSE BUILDING</del>
ANNEXURE-III	DEGREE OF PROTECTION FOR VARIOUS EQUIPMENT

**VOLUME : IIIF**

**SECTION-IV**

**ELEVATORS**

1.00.00 **CODES AND STANDARDS**

1.01.00 The design, manufacture and testing of the elevators and components thereof shall, unless specifically stated otherwise, conform to the following specific codes and standards as applicable, including its latest amendments subsequent to the date of publication as mentioned below :

1.01.01 IS-14665 : Electric Traction Lifts.

1.01.02 IS-2365 : Specification for Steel Wire Suspension Ropes for Lifts and Hoists.

1.01.03 State Elevator and Escalator Act

1.01.04 State Elevator and Escalator Rules

1.01.05 Indian Electricity Act.

1.01.06 Indian Electricity Rules

1.01.07 Any other acts/standards as applicable as mentioned in volume : II-A of this specification.

1.02.00 The installation of the elevators under this section shall be carried out in conformity with the local acts/rules with latest amendments which are in force, including the rules of fire lifts, as shall be required by the Bidder to obtain license for the elevator from concerned authorities.

1.03.00 Technical requirements of the elevators shall be as given in Attachments enclosed to this section.

1.04.00 Minimum acceptable degree of protections for various equipment are presented in Annexure-III.

1.05.00 In case of any contradiction between the above standards and attachments the stipulation in the attachments shall prevail and shall be binding on the Contractor.

Stipulations in this section shall prevail in case of any contradiction between this section and other relevant sections/ volumes.

2.00.00 **SCOPE OF WORKS**

The scope of works under this section shall be as below. Items though not specifically mentioned but needed to make the installation of the elevators complete in all respects are also to be furnished by the Contractor.

2.01.00 **Scope of Supply**

2.01.01

- a) ~~One (1) goods elevator complete with all accessories shall be furnished for steam generator unit at the suitable locations so that the same can be used for the movement of materials of the various steam generator parts. The lift shall be connected to the steam generator structural steel and as such part of the lift load shall be transferred to the steam generator columns. The Bidder shall ensure that the steam generator columns are designed to take the loads due to the lift shafts and connecting platforms at different elevations.~~
- b) ~~One (1) passenger elevator complete with all accessories shall be furnished for steam generator unit at the suitable locations so that the same can be used for the movement of man for the inspection and maintenance of the various steam generator parts. The lift shall be connected to the steam generator structural steel and as such part of the lift load shall be transferred to the steam generator columns. The Bidder shall ensure that the steam generator columns are designed to take the loads due to the lift shafts and connecting platforms at different elevations.~~
- c) ~~One (1) passenger cum goods elevator complete with all accessories shall be furnished for crusher house at the suitable locations so that the same can be used for the movement of man & materials for the various equipments. The lift shall be connected to the crusher house structure and as such part of the lift load shall be transferred to the building column. The Bidder shall ensure that the crusher house columns are designed to take the loads due to the lift shafts and connecting platforms at different elevations.~~
- d) ~~One (1) passenger elevators shall be included in TG building at "C Row" near to control room upto D/A floor level. The landing for the elevator shall be provided for all the floors in TG building. This shall put into operation before commissioning activities start. These shall be connected to the power house/structural steelwork and as such part of their loads may be transferred to the main power house/ structural steelwork columns. The Bidder shall ensure that these columns are designed to take care of the loads due to elevator shafts and connecting platforms at different elevations.~~
- e) ~~One (1) passenger elevator complete with all accessories shall be provided in the Service House Building to have access in various floors.~~

- 2.01.02 The above elevators shall be provided with the following accessories as applicable, for all the above elevators.
- a) Elevator car complete with door, door hangers and tracks, push button station and operating panel, car position indicators, fan, telephone hooked upto EPABX of the plant and illumination fittings and other required accessories.
  - b) All required structural steel members and components to accommodate the elevator and accessories in the elevator shaft, steel guides for car and counter weight, necessary steel items associated with elevator such as machine supporting beams, bearing plates, supporting channels, sill supporting angles etc.
  - c) Counter weight, counter weight guard, sheaves and beams, ropes, hoist rope compensation, terminal buffers and guide rail lubricator device.
  - d) Complete drive machinery and accessories, electrical and control equipment including power and lighting distribution boards and switch fuse units for power and lighting. Necessary brakes and also automatic leveling device, terminal and final limit switches and all required protective devices including starters, switch fuse unit etc. Complete drive machinery shall include motors, starters, switchgears, fuses, switches, relays, junction boxes etc. as minimum requirement.
  - e) Hoist way doors and push button station with tell-tale lights at all the elevator landings.
  - f) Any other fittings and accessories required for the safe and efficient operation of the elevators.
  - g) All required foundation plates and/or base plates, inserts, anchor bolts, lifting lugs, eye bolts etc. wherever necessary.
  - h) Fireman's switch as per rules of fire lifts.
  - i) Earth leakage circuit breaker.
- 2.02.00 For detailed scope of services, Volume IIA of this specification shall be referred to.
- 3.00.00 **OPERATION AND CONTROL PHILOSOPHY**
- 3.01.00 The elevators, while starting from any level, shall start at rated speed but during stopping, elevator shall slow down to lower speed when the car reaches around one meter of the selected landing floor and stop when reached the landing floor. The control system shall be microprocessor based with AC variable voltage and variable frequency drive.

- 3.02.00 The elevators specified herein shall be operated in selective collective automatic mode of operation as defined in IS-14665. Operation and Control features of this elevator shall be as follows :
- 3.02.01 One push button for each of the all landings shall be provided inside the car. Two push buttons, one "UP" button and one "DOWN" button, shall be provided at each of the intermediate landings. The uppermost and lower most landings shall be provided with one push button.
- 3.02.02 Calls initiated by the car or landing push buttons shall be registered and stored until answered, irrespective of the car being in motion or any landing door being open.
- 3.02.03 The car shall answer calls in one direction of travel, that is all "UP" landing calls shall be answered when the car travels in the upward direction and "DOWN" landing calls shall be answered when the car travels in the downward direction, except in the case of uppermost or lowermost calls which shall be answered as soon as they are reached irrespective of the direction of travel of the car.
- 3.03.00 Besides the automatic mode of operations described in Clauses 3.02.00 above, the elevators shall have provision for attendant operation also, transfer of operation between automatic control and attendant operation being achieved by a key operated switch in the car.
- 3.04.00 The operation of the elevators shall be through push button station located inside the lift car. Suitable interlock shall be provided so that the elevators shall not move unless the door are properly closed. The landing doors of any floor shall not open when the elevator is not on that floor. Push buttons shall be fixed in one car for holding the doors open for any length of time required.
- 3.05.00 The elevators under this section shall be treated as "Fire Lifts". "Fire Switch" in a glass front box shall be provided adjacent to the lifts at the entrance level, the function of which is to enable the fire authority to take over the complete control of the lifts, when required. When the switch is on, landing call points shall become inoperative and the lift shall be on the car control only. When the switch is off, the lift will return to normal working.
- 4.00.00 **PERFORMANCE REQUIREMENT**
- Performance requirement for the elevators shall be guided by the Attachments/Annexure enclosed with this section.
- 5.00.00 **DESIGN AND CONSTRUCTION**
- Design and constructional requirement of all the elevators and components thereof shall be in line with Indian Standards specified in clause 1.00.00 above as applicable unless specified otherwise.

5.01.00      **Load and Speed**

The elevator shall lift a pay load as indicated against rated load of the applicable Annexure attached to this section or its nearest as per manufacturer's present standard in addition to the weight of the car and its accessories and shall travel at a rated speed as indicated in the applicable Annexure.

5.02.00      **Travel and Landing**

Travel of the lift car, number and elevations of the landing levels shall be as indicated in Annexure attached to this section.

5.03.00      **Car**

5.03.01      Size

The dimensions of the lift car and car platform and door shall be as per IS-14665.

5.03.02      Car Frame

Lift car shall be carried in a complete frame of steel which shall be sufficiently rigid to withstand the operation of the safety gear without permanent deformation to the car frame.

At least four renewable guide shoes or guide shoes with renewable linings or set of roller guides shall be provided, two at the top and two at the bottom of the car frame.

5.03.03      Car Enclosure

Car shall be enclosed on all sides by means of car body and door. The sides of the car shall be lined with heavy gauge sheet steel panels properly braced and reinforced. The enclosure shall be flush on the inside and securely fastened to the platform. Car inside enclosure shall be of stainless steel plate of grade SS:304 of bright finish.

Car of the elevators specified herein shall be equipped with decorated Stainless Steel hand rails on three sides. Car shall be equipped with fan with grills and suitable lighting complete with decorative fittings. The light shall be left burning during the whole time the lift is available for use.

Necessary provisions shall be made for adequate ventilation of the car. Ventilation openings shall be provided in the enclosure walls as per requirement of IS-14665. To permit switching off of the power supply to the lift without switching off the fan and light a separate switch shall be provided for fan and light.

The enclosure of lift car shall withstand the maximum possible thrust applied normally at any point, excepting any vision panel, without permanent deformation. Glass shall not be used in the lift car except for the following purposes :

- a) As covers for certificate.
- b) For lighting fixtures.
- c) For appliances used in connection with the operation of the car.
- d) For vision panels and mirrors.

Suitable arrangement to secure isolating cushion between car and the steel car-frame shall be provided.

Telephone or paging facility shall be installed in the lift car. The Bidder shall provide suitable cabinets in the car to house hand sets. The Bidder shall also provide necessary wiring for telephone or paging connection from the car to a terminal box adjacent to the lift well.

The car panels shall be given final painting. The type and colour of the final painting shall be subject to the approval of the Owner/Consultant.

5.03.04 Car Platform

It shall be constructed of structural steel shapes securely fastened together with one layer of wood flooring. Floor of the elevators shall be as specified in Annexure. The platform construction should be designed on the basis of rated loads evenly distributed.

Since, the car levelling devices will be used, substantial aprons of sufficient depth shall be fitted to the car floor to ensure that no space is permitted between the threshold and the landing while the car is being levelled to a floor.

5.03.05 Car Roof

Car roof shall be covered with sheet metal. The construction of roof should be strong enough to be capable of supporting atleast two persons.

A three pin plug socket with switch of industrial type having adequate capacity for a hand lamp shall be fitted on top of the lift car for use by persons working thereon during maintenance.

5.04.00 **Car and Hoistway Doors**

5.04.01 Type of door

Type of car and hoistway doors shall be as indicated in the Annexure and made of steel provided with necessary rubber buffers. Doors for fire lifts shall have fire resistance for minimum one hour. The final paints on car door and hoistway doors shall be same and shall match that of the car.

5.04.02 Door Hangers and Tracks

Hangers and tracks for car door and each hoistway door shall be furnished. Suitable material shall be used to minimise noise. Ball bearing, rollers or equal arrangement shall be provided to take upward thrust of the doors. Suitable devices shall be furnished for transmitting motion from one door panel to the other.

All required materials for landing entrance e.g. extruded aluminium or equivalent sills, strut angles, headers etc. shall be provided.

5.04.03 Door Operators

The door operation shall have power opening and power closing. Necessary electric type door operators shall be furnished. The car door and the hoistway door shall be mechanically connected and shall move simultaneously during opening and closing. The necessary door cushioning devices shall be furnished.

The car door and the hoistway door shall open automatically when the car stops at a landing. Should the electric power fail, the door operator shall be so designed that doors can be manually opened from within the car. Necessary door locking devices shall be furnished. Necessary switches shall be furnished in the elevator machine room to control the operation of the door.

5.05.00 **Car Self-leveling Device**

The elevator shall be equipped with automatic self-leveling devices, to bring the car to the floor landings. These self-leveling devices shall correct for overtravel and rope stretch.

5.06.00 **Car Operating Panel**

In the car, these shall be furnished, an operating panel containing push buttons, numbered to elevations of the landings served; two position key-operated switch, marked to indicate "With Attendant" and "Without Attendant"; an emergency stop switch; a buzzer; an emergency call button connected to a bell to be provided by the Contractor at the bottom most landing of each elevator to serve as an emergency signal and also in the control room with an indication; a non-stop button; push button, or switches for lighting and fan; up push button, down push button, one door open push button and other push buttons, switches, emergency light, telephone hand set etc. as required.

The emergency call button mentioned above shall have two sets of potential free contact and shall be suitably wired upto the control panel in the machine room for indication or annunciation at unit Control Room shall be provided.

When the key switch in the car operating panel is set at the attendant position, the attendant will have full control of the operation of the elevator. Any hoistway calls and other door close push button which are then registered will cause a buzzer to sound in the car operating panel and the appropriate indicator light to illuminate.

5.07.00 **Car Position Indicator in Car**

For the elevators, signal indication above the entrance in the car shall be provided by the appropriate numeral (which shall be the elevation of the respective floor) being illuminated when the car is passing the corresponding floor. The indication shall remain illuminated when the car is stopped at a floor. Up and down direction jewel lights shall also be provided.

5.08.00 **Push Button Station and Call-registered Tell-tale Lights at Hoistway**

5.08.01 The elevators as described in clause 3.00.00 above shall be equipped with a push button station consisting of a single up or down push button at terminal landings, and up and down push buttons at each intermediate landing including call registered lights (up or down call registered lights at each terminal landings and both up and down call-registered lights at all intermediate landings). These shall illuminate when the corresponding button is pressed to indicate that the call is registered and shall remain illuminated until the call is answered. An illuminated car position indicator similar to that specified for car in clause 5.07.00 shall be provided above the entrance of all the landings.

5.08.02 The word "Fire Lift" shall be conspicuously displayed in radium paint on the lift landing doors of the elevators designated as fire lifts.

5.09.00 **Safety Shoe Device on Car Door**

Safety shoe device shall be furnished on car doors. Safety shoe shall extend the full height on the closing edges of the car doors. The arrangement shall be such that should the safety shoe touch a person or an object while the door is closing, the car and the hoistway door shall return to the open position. The doors shall remain open until the expiration of a pre-determined interval and then close automatically.

5.10.00 ~~Emergency Exit~~

~~Elevator car shall be provided with an emergency exit of adequate dimensions. The location of the emergency exit shall be at the top of the car.~~

5.11.00 **Terminal Buffers**

The terminal buffers shall be furnished for stopping the car and the counter-weight at the extreme ends of travel. All structural steel members required to install the buffer shall be supplied under this section.

**5.12.00 Load Plate**

A load plate giving the rated pay load of the elevator shall be fitted in the car in a conspicuous position. The rated load shall be given in kilograms and also in number of passengers.

**5.13.00 Counter-weights and Counter-weight Frames**

Counter-weight sections shall be mounted on structural metal frames so designed to retain the weights securely in its place.

Counter-weight frames shall be guided on each guide rail by upper and lower guiding members attached to the frame.

A substantial metal counter-weight guard of required length shall be provided at the bottom of the hoist-way.

**5.14.00 Guides for Car and Counter-weight**

Car and counter-weight guides shall be of rigid steel and shall be continuous throughout the entire length and shall be provided with adequate steel bracings and stiffeners. The necessary lubrication device for guide rail shall be provided.

**5.15.00 Limit Switches**

Normal terminal limit switches to slowdown and stop the car automatically, shall be provided at terminal landings and final limit switches shall be furnished to automatically cut-off the power and apply the brake, should the car travel beyond the terminal landings.

**5.16.00 Controller & Traction Machine**

5.16.01 The design ambient temperature for these equipment shall be taken as 50°C. The insulation of motor shall be class "F" and temperature rise shall be limited to Class "B".

5.16.02 Complete details of controller and traction machine shall be furnished by the Bidder.

5.16.03 The elevators being offered with Microprocessor based AC variable voltage and variable frequency type control, motor and generator shall be mounted on independent shafts coupled with proper coupling.

5.16.04 Number of starts per hour for which motor shall be capable, shall be selected by the Bidder for the given applications and in accordance with applicable code/standard.

- 5.16.05 Necessary brakes shall be provided in the traction machine.
- 5.16.06 Protective relays shall be furnished on the controller to protect against phase reversal, low voltage and phase failure. Overload and other protective relays shall also be furnished for traction motor. Single phasing preventor shall also be provided to protect motor while running at no-load.
- 5.17.00 **Lighting**
- Lighting shall be provided in machine room, lift well and lift cabin.
- Two (2) nos. 40 W Fluorescent tubes with fittings shall be provided at each of the machine room and the lift cabin whereas incandescent G.L.S. lamp shall be provided in the lift well. Emergency lighting shall be provided in all the places including Cabin. All necessary wires, conduits, junction boxes shall be supplied. In the lift cabin indirect illumination type fitting shall be provided.
- 5.18.00 **Grounding**
- Grounding of all enclosure of live parts shall be done as per applicable Electricity Rules with latest amendment. All structures of the lift shall also be grounded. Necessary material for grounding shall be supplied by the Contractor.
- 5.19.00 **Other Electrical Items**
- 5.19.01 Special care and precaution shall be taken regarding the handing of lift trailing cable loops between the points of suspension. A 1/4" sling rope should be used for tying up. Conductor and insulation of these trailing cables shall be flexible with suitable reinforcement provided.
- 5.19.02 All control cables shall have crimped type lugs and wire numbering ferrules at either ends.
- 5.19.03 For general technical requirements, Volume V of this specification shall be referred.
- 5.20.00 **Safety Gears**
- The elevator shall be provided with one or more safety devices capable of stopping and sustaining the lift car with full rated load in the car at governor tripping speed.
- When the safety gear is applied, decrease in the tension of the governor rope or motion of the car in the descending direction shall not release the safety gear.
- 5.21.00 **Overspeed Governor**
- The elevator shall be equipped with overspeed governor device which operates to apply the safety gear in the event of the speed of the car in the descending direction exceeding a predetermined limit.

5.22.00 **Brakes**

The machine shall be provided with direct current spring set, solenoid released, double shoe brakes of sufficient capacity to stop the car at any position with the design load. These brakes shall be designed in such a way to apply automatically in the event of power supply failure. The details of equipment offered shall be indicated in the offer.

5.23.00 **Rope**

Suitable traction steel hoist ropes of the sizes and number to ensure proper wearing qualities shall be supplied. As a minimum, the number of ropes shall comply with the factor of safety requirements of Indian Standard for lift/elevator. The full details of ropes, the maker's name, trade name, breaking strength, designed factor of safety of all ropes shall be submitted with the bid.

5.24.00 **Ringing of Stranded Lift**

During prolonged power failure, arrangement shall be provided, so that, after cutting out supply point manually through hand wheel the lift stranded between two floors may be brought to the nearer floor.

Alternative offer for bringing the stranded lift to the nearer floor by automatic winding arrangements may be given and price quoted separately.

5.25.00 **Lifting Attachments**

All equipment/component shall be equipped with suitable lifting attachments, e.g. lifting lugs, eye bolts etc. to facilitate erection and maintenance.

6.00.00 **INSPECTION AND TESTING**

6.01.00 The following specific test as applicable shall be carried out by the Contractor as minimum requirement for the elevators.

6.01.01 All materials used in manufacture of various components shall be of tested quality and shall conform to relevant standards/ specifications.

6.01.02 All welding shall be carried out as per welding procedures qualified as per ASME Section-IX or equivalent national / international standard. Welding procedures shall be forwarded for approval. Only qualified welders shall be employed for welding.

6.01.03 All NDT operators should be qualified as per ASNT-TC-IA.

6.01.04 Forged blanks greater than or equal to 40 mm thick and rounds greater than or equal to 50 mm dia shall be subjected to ultrasonic test to ensure free from internal defects.

- 6.01.05 All welds shall be subjected to dye-penetration test and visual examination.
- 6.01.06 All forged components shall be subjected to DPT/MPT after machining.
- 6.01.08 Buffer springs shall be subjected to load test as per relevant specifications. Material certificates for springs shall also be furnished.
- 6.01.09 Steel wire ropes shall be subjected to all the tests including material test as per relevant standard. Braking load test shall be carried out as per relevant national/international standards.
- 6.01.10 All components prior to assembly shall be checked for dimensions.
- 6.01.11 All rotating components shall be shop tested for dynamic balancing as per ISO-1940.
- 6.01.12 Car sling and car body in assembled condition shall be checked for position of all major components i.e. car sling inside depth, width, height and respective positions of all accessories within the same.
- 6.01.13 Induction Motor shall be subject to both type and routine tests in accordance with IS-325 and IS-4029. In addition, following tests shall also be carried out :
- a) 20% overspeed test for 2 minutes.
  - b) Vibration measurement.
  - c) Measurement of noise level as type test.
  - d) Degree of protection test on motor enclosure and terminal box as per IS-4691 as type test.
- 6.01.14 Following items shall be tested as per relevant standard :
- a) Trailing cable and copper conductors. PVC cables shall also be subjected to type, routine and acceptance tests.
  - b) Brake coil.
  - c) Relays contactors, instruments and controlling equipment.
- 6.01.15 The control panels, door operating panels, junction box & other metallic enclosures test shall conform to specific degree of protection.
- 6.01.16 Mechanical balance test and vibration levels of elevator and accessories shall be carried out.
- 6.01.17 Insulation, resistance test, high voltage withstand test of all wiring shall be carried out.
- 6.02.00 After installation of complete elevator, necessary trial run and performance tests shall be carried out by the Contractor in presence of Purchaser to

determine that equipment supplied is satisfactorily installed and commissioned.

The performance tests to be conducted shall interalia include but not limited to the following:

- a) Car operates smoothly for full length of travel.
- b) Car stops at each platform elevation under both loaded and unloaded conditions and alignment with floor level.
- c) Car travels at specified speed when loaded at specified capacity.
- d) Enclosure doors operate properly.
- e) Mechanical and electrical equipment function as specified.
- f) Input power at motor terminal at specified design capacity and speed
- g) Working of all safety interlocks and safety features including emergency braking in case of freefall of the car

All performance tests shall be conducted by the Contractor and the procedure for conducting such tests shall be approved by Owner.

**6.03.00 Permits & Inspection**

Regarding Permits and Inspection, Bidder shall obtain and pay for necessary Municipal or State inspections and permits as required including license fees for installation and inspection of elevator equipment and also make such tests as called for by the regulations of such authorities in the presence of the Purchaser representative. Bidder shall be responsible to obtain license for operating the elevator at site. Checking and inspection by the statutory authorities and obtaining license shall be Bidder responsibilities.

**7.00.00 DRAWINGS, DATA, AND INFORMATION**

7.01.00 In addition to the Proposal Data Sheets in Volume-IX of this specification duly filled up, Bidder shall submit the following drawings/data/information for the elevator along with this offer.

7.01.01 Layout drawing showing principal dimensions of the elevator car in plan and the elevator car and shaft in elevation.

7.01.02 Layout drawing showing the location of various equipment in the elevator machine room.

7.01.03 Complete general arrangement drawing of the elevators and its support structure showing all landing levels and enclosures.

7.01.04 Electrical Control Schematics.

- 7.01.05 Write-up, description and illustrative pamphlets on various components of the elevator and its control, interlock and safety devices.
- 7.01.06 Foundation details and loading.
- 7.01.07 Load on elevator columns.
- 7.01.08 Layout of conduits, conductors, cables etc.
- 7.01.09 Other drawings, data sheets and literature as necessary.
- 7.02.00 Drawing, Data, Information to be furnished by the successful Bidder after award of contract.
- 7.02.01 All drawings, data and information as asked for in Clause No. 7.01.00 in finalised form for review and approval of Owner/Consultant.
- 7.02.02 Detailed layout drawings including foundation and structural design data for elevator shaft and elevator machine room. The data shall include braking load on guides, reaction of buffers on lift pits, reaction on support point on machine room, hoistway etc.
- 7.02.03 Details of block outs, embedments, inserts on RCC Works.
- 7.02.04 For Mandatory Spares, Spares required for erection and commissioning, Recommended Spares, Special Tools and Tackle, fixtures etc., as required for regular operation and maintenance of the equipment offered and supply of first charge of lubricating oil, inhibitor oil and also adequate quantity of the consumables, ~~please refer Technical Specification Volume II A.~~
- 7.02.05 Complete Electrical Control, schematic wiring diagram of power and control room.
- 7.02.06 Write-up explaining the sequence of operation of control circuits and elevator components when an operation button is pressed.
- 7.02.07 Performance and characteristics curves for motors.
- 7.02.08 Drawings of control panels, operating panels, position indicators, in car and hoistways, push button station and call registered tell-tale lights at hoistway. These include Electrical Control Diagram and detailed circuit diagrams and physical arrangement/location diagrams of various electrical components in the Controller in the machine room, in the hoistway, in the car, at the landing etc.
- 7.02.09 Detail of pit floor, landing and landing entrance, machine room floor etc.
- 7.02.10 Other drawings and data as necessary.
- 7.02.11 Reports on shop tests and test certificates.

7.02.12 Material and performance test certificates.

ANNEXURE-II

**PASSENGER ELEVATORS FOR FGD CONTROL BUILDING**  
~~STEAM GENERATOR, POWER HOUSE BUILDING & SERVICE BUILDING~~

1.	Type of service	Passenger type. As per scope of supply ref cl. No. 2.0.1, Section IA of Technical Specification.
2.	Rated load on elevator	<del>1080 Kg (minimum)</del>
3.	Rated speed of lift	<del>0.5 M/Sec.</del>
4.	Minimum number of floors to be served	<del>Steam Generator To be decided by Bidder and shall be subjected to Purchaser's approval.</del> <del>Power House Building All floors in the TG building upto deaerator floor.</del> <del>Service Building Various floor levels shall be finalized by APPDCL during detail engineering stage.</del>
5.	Method of control	ACVVVF control with automatic level adjustment.
6.	Position of machine room	Directly above the lift shaft.
7.	Car enclosure construction, design and finish of car	S.S. sheet fabricated smooth finish spray painted to approved shade.
8.	Size of platform and car entrance	As per IS-14665
9.	Car and landing door	Horizontal Sliding door.
10.	Flooring	As per scope of supply ref cl. No. 2.0.1, Section IA of Technical Specification.
11.	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.
12.	Signal	Car position indicator in car and at all floors, telltale lights at all floors, battery operated alarm bell and emergency light with suitable battery, battery charger and controls. Remote alarm and Public address system to be provided.
13.	Method of operation of car and landing doors	Power operated with automatic door opening and closing device.

14.	Lighting & fan	One cabin fan, two recessed fluorescent lamp fittings.
15.	Power Supply	
	a) Power	415 Volts, 3 phase, 50 c/s, 3 wire system
	b) Lighting & fan inside the car	240 volts, 1 phase, 50 c/s
16.	Other requirements	<ol style="list-style-type: none"> <li>1. Plant Telephone Communication system shall be extended upto the elevator car through EPABX in M/C room..</li> <li>2. Suitable arrangement shall be provided to intimate unit control room during emergency in the form of audio-visual alarm.</li> <li>3. Automatic rescue device.</li> <li>4. If floor to floor distance between 2 floors is more than 10m, dummy landing should be provided in between these 2 floors. Dummy landing should have the connectivity with the staircase.</li> <li>5. Hall Lantern &amp; gong with scrolling indicator.</li> <li>6. Scrolling indicator in car.</li> <li>7. CFL lighting inside car</li> <li>8. Overload sensing device &amp; warning indicator.</li> <li>9. Announcement of floor level.</li> </ol>

**ANNEXURE-III**

**DEGREE OF PROTECTION  
FOR  
VARIOUS EQUIPMENT**

<b>Sl. No.</b>	<b>Equipment</b>	<b>Degree of Protection</b>
1	A.C. Motor	IP 54
2	Controller	IP 54
3	Hall Buttons Fixture	IP 54
4	Hall Position Indicator	IP 54
5	Car Operating Panel	IP 54
6	Car Position Indicator	IP 54
7	Safety Operating Switch (car)	IP 54
8	Junction/Inspection Box	IP 54
9	Lighting Fixture (for shaft & M/C room)	
	a) Tube Light	IP 21
	b) Bulk Head	IP 21
10	Brake	IP 21
11	Indoor Equipment (car light & fan junction box)	IP 54

**SECTION-XIII**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**PROTECTIVE LINING AND PAINTING**

**C O N T E N T S**

<u>CLAUSE NO</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1.00.00	INTENT OF SPECIFICATION	1
2.00.00	CODES & STANDARDS	1
3.00.00	GENERAL REQUIREMENTS	2
4.00.00	EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER	4
5.00.00	COATING PROCEDURE AND APPLICATION	7
6.00.00	TEST REQUIREMENTS	8
7.00.00	INFORMATION / DATA REQUIRED	12

**SECTION-XIII**  
**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 :~~

~~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.

4.03.09 All machined surfaces shall have two (2) coats of water repellent 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 than 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  $\pm 20\%$  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)
- $$\text{Testing Voltage } V = 7900 \sqrt{T} \pm 10 \text{ percent where } T \text{ is the average coating thickness in mm.}$$
- 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 ASTM D 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/cm<sup>2</sup> required by project specification is exceeded and the test is discontinued, (b) the maximum PSI/MPa/Kg/cm<sup>2</sup> 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.



**1X800 MW KOTHAGUDEM TPP FGD  
TECHNICAL SPECIFICATION  
FOR  
ELEVATORS**

SPECIFICATION NO.: PE-TS-439-502-A001

SECTION: I

SUB-SECTION: IA

REV. 01

DATE: MAR'23

SHEET 1 OF 2

**FUNCTIONAL/PERFORMANCE / DEMONSTRATION GUARANTEE  
(AS APPLICABLE)**



**1X800 MW KOTHAGUDEM TPP FGD  
TECHNICAL SPECIFICATION  
FOR  
ELEVATORS**

SPECIFICATION NO.: PE-TS-439-502-A001

SECTION: I

SUB-SECTION: IA

REV. 01

DATE: MAR'23

SHEET 2 OF 2

**TRIAL OPERATION, COMMISSIONING, PERFORMANCE/ DEMONSTRATION  
GUARANTEE TESTS:**

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

The parameters/ capability is to be demonstrated of various equipments/system as listed below.

- i. Overload test.
- ii. Travel speed and hoist speed checks.
- iii. Drop test.
- iv. Checks for interlocks & safety systems.
- v. Checks for operation from inside the cage.
- vi. Rated capacity of the elevator.
- vii. Accurate positioning of the elevator.

**ANNEXURE-III  
QUALITY ASSURANCE PLAN**

1		2	3	PROJECT:				Q.P/FQP. NO & REV:				
				MANUFACTURING QUALITY PLAN FOR=M/S vendor				DATE:1 PAGE: 1 of 4 JOB NO:				
Sr. No.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	10			REMARKS
									D	VE	M	
<p><b>A. Boughtout Items.:</b></p> <p>1 Raw materials, Round Hexagon &amp; Structural. Type : EN-8/EN-8D to EN-9 B and En-24</p> <p>2 Raw material Rounds, En-8, EN-9, EN-24</p> <p>3 Casting : a. C.I. Graded Castings</p>												
<p>4 Suppliers Item : a. Manufactured Items b. Moldings Rubber Items ( ABSORBER ) c. Springs (Buffer) d. Guide Rail. e. Wire rope</p>												
<p>*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 = Rvendorpit Quality Control ( vendor). *P =Perform. *Q.C.R = Quazity Control Register ( vendor). *T.C. = Test Certificate, *D.I.R = Daily inspection register. *D = Documents. *U.E.R. =Ultra Sonic Examination Record .</p>												



1	2	3	4	5	6	7	8	9	10			11
Sr. No.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD	AGENCY			REMARKS
									D	VE	M	
2	Motor Assembly :	A-Winding Insulation test. B-Insulation Resistance C-Motor testing for elect. Pmt. D-Vibration measurement & noise level	Major Major Major Major	High Volt. Test Measurement Elect. Measurement	100% 100% 100% 100%	IS : 325-96 1.5 KV for 5 SEC > 10 mega ohms IS : 325 vendor - Norms	IS :325-96 1.5 KV for 5 SEC. > 10 mega ohms IS : 325 vendor -Norms	D.I.R QA/FMT/13 Test report Test report Test report	V V V V	W W W W	V V V .	
3	Speed Governor Assembly :	Tripping speed Easy Run test	Major	Function Check	100%	IS : 9878 LCH -112	IS : 9878 LCH - 112	T.C IN Pant.	V	W	V	
4	Controller Assembly / VVVF Unit.	1. Visual Inspection 2. Electrical Checks (Routine Test). 3. Functional Checks 4. Pretreatment in seven tank for sheet & paint thickness.	Major do do Major	Visual Electrical Function Measurement + Visual	100% 100% 100% Sampling	vendor Norms do do do	vendor Norms do do do	T.C do do vendor - FMT.	V V V V	W W W W	V V V V	
*V= Verification as appropriate. *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 = Rvondript Quality Control (vendor) , *P =Perform. *Q.C.R = Quality Control Register (vendor) , *T.C. = Test Certificate, *D.I.R = Daily inspection register. *U.E.R. =Ultra Sonic Examination Record .			MANUFACTURER SEAL AND SIGN		CONTRACTOR SIGN AND SEAL.		NAME & SIGN OF APPROVING AUTHORITY & SEAL.					





**1 X 800 MW KOTHAGUDEM TPP FGD**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ELEVATORS**

SPECIFICATION NO.: PE-TS-439-502-A001

SECTION: I

SUB SECTION: IA

REV: 01

DATE: JAN'26

Page: 1 of 1

**ANNEXURES**



**1 X 800 MW KOTHAGUDEM TPP FGD  
TECHNICAL SPECIFICATION  
FOR  
ELEVATORS**

SPECIFICATION NO.: PE-TS-439-502-A001

SECTION: I

SUB SECTION: IA

REV: 01

DATE: JAN'26

Page 1 of 6

**ANNEXURE-I**  
**LIST OF MAKES**

<b>SR. NO.</b>	<b>ITEM</b>	<b>SUPPLIERS</b>	<b>PLACE</b>	<b>REMARKS</b>
1.	WIRE ROPES	USHA MARTIN	RANCHI	
		BHARAT WIRE ROPE	MUMBAI.	
2.	TRAILING CABLE	GEBUR & GRILLER- AUSTRIA		
		DAETWYLER (THELMA) CABLES- SWITZERLAND	SWITZERLAND	
		LAPP	GERMANY	
		UNIVERSAL	-	
		INCABSTEP	-	
3.	BUFFER SPRINGS	INDUSTRIAL STEEL SPRING	-	
		ALL INDIA STEEL SPRING MANUFACTURING COMPANY	-	
		KOLKATA SHAW COMPANY	KOLKATA	
		SUPER INDIA SPRINGS	KOLKATA	
		MESCO SPRING.	MUMBAI.	
4.	GEAR INTERNALS	PREMIUM ENERGY TRANSMISSION LTD,	PUNE	
		SICOR S.P.A-	ITLY	
		OEM		
5.	DRIVER MOTOR	Seimens-	MUMBAI	
		ABB	FARIDABAD	
		BHARAT BIJILI	-	
		CGL	-	
		KEC	-	
6.	STAINLESS STEEL	OEM	-	
		SAIL,	-	
		MINOX METAL,	-	
		JINDAL	-	
			-	
7.	CR SHEET	ESSAR STEELS,	-	
		BHUSHAN STEELS	-	
8.	CABLES	DELTON,	-	
		NICCO	-	
		UNIVERASL,	-	
		FINOLEX,	-	
		CCI	-	
		MACROTHREM,	-	
		VARSHA CABLES	-	
		KEI.	-	
		PARAMOUNT	-	
POLYCAB.	-			
9.	RELAYS	SIEMENS	-	
		SCHNEIDER TELEMECHANIQUE	-	



**1 X 800 MW KOTHAGUDEM TPP FGD  
TECHNICAL SPECIFICATION  
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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		SALZER,	-	
		SCHNIDER ELECTRIC.	-	
		OEN	-	
10.	CONTACTORS	SIEMENS	-	
		L&T	-	
		GE	-	
		SCHNEIDER TELEMECHANIQUE.	-	
11.	TRANSFORMERS	SHARP ELECTRONICS	-	
		MELCON CONTROLS	CHENNAI	
		LOGITECH	-	
		GUNHAWA ELECTRIC CO LTD.	-	
12.	INVERTOR (V3F)	YASKAWA-	GERMANY	
		TOSHIBA	JAPAN.	
13.	T GUIDES	SAVERA	CHINA	
		D.D HITECH	-	
		MARAZZI	-	
14.	CAR DOOR OPERATOR	Wittur GMBH	AUSTRIA	
		FERMATOR	-	
		OEM	-	
15.	INFRA-RED DOOR CURTAIN	MEMCO	UK	
		WECO	-	
		TLJONES	-	
16.	BATTERY (LEAD ACID)	EXIDE.		
		HBL POWER SYSTEM-	HYDERABAD	
		AMAR RAJA	TIRUPATI	
		AMCO SAFT INDIA LTD	BANGALORE.	

**NOTE:**

1. THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND CUSTOMER APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY COMMERCIAL & DELIVERY IMPLICATION TO BHEL.

BIDDER TO PROPOSE SUB VENDOR WITHIN 4 WEEKS OF PLACEMENT OF LOI. THEREAFTER NO REQUEST FOR ADDITIONAL SUB-VENDOR SHALL BE ENTERTAINED.

2. IN CASE OF ASSEMBLED IMPORTED ELEVATOR, MAKES OF BOI SHALL BE SUBJECT TO BHEL/ CUSTOMER APPROVAL DURING DETAIL ENGINEERING STAGE WITHOUT ANY COMMERCIAL IMPLICATION AT CONTRACT STAGE.

3. DEALERS ARE NOT ACCEPTABLE FOR ANY ITEM OF THE PACKAGE. BIDDER SHALL PROCURE ALL ITEMS INCLUDING PLATES, STRUCTURAL ETC. FROM APPROVED SUB VENDOR ONLY.



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**ANNEXURE-II**  
**List of Mandatory Spares for Elevators**

NIL



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**ANNEXURE-III**  
**List of Tools & tackles for Elevators**

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



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**ANNEXURE-IV**

**Drawing document submission schedule**

S no.	Description	Schedule
1	First submission of dwg/docs as per MDL	Within 21days from placement of LOI
2	Every repeat submission	Within 10 days
3	Response time by BHEL	Within 21days 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>).



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**ANNEXURE-V**

**MDL FOR ELEVATOR**

SL. NO.	BHEL DOC NO.	TITLE	APP. CAT
1	PE-V0-439-502-A103	GAD OF FGD CONTROL BUILDING ELEVATOR	A
2	PE-V0-439-502-A104	DATA SHEET FOR FGD CONTROL BUILDING ELEVATOR	A
3	PE-V0-439-502-A105	MQP OF FGD CONTROL BUILDING ELEVATOR	A
4	PE-V0-439-502-A106	O & M MANUAL FOR FGD CONTROL BUILDING ELEVATOR	I
5	PE-V0-439-502-A107	WIRING DIAGRAM & POWER DISTRIBUTION SCHEMATIC FOR FGD CONTROL BUILDING	I

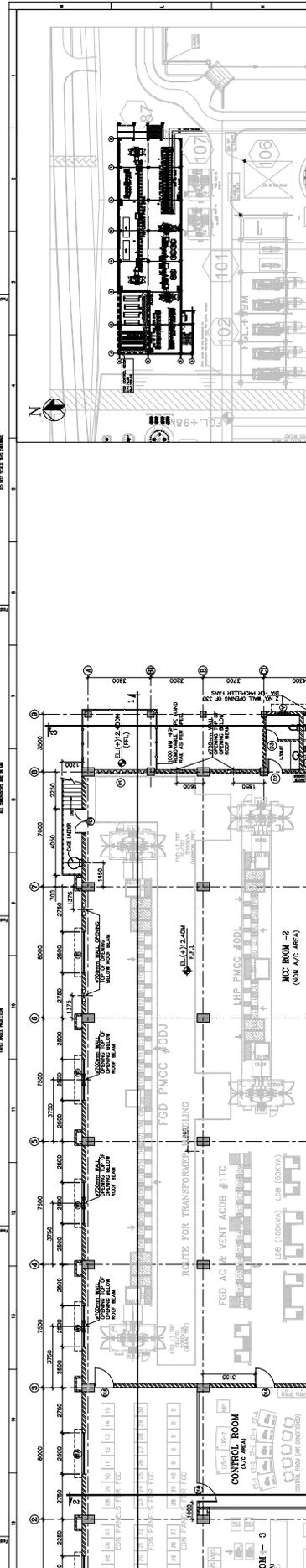
A= APPROVAL  
I= INFORMATION

**CIVIL INPUT DETAILS**

Refer attached civil input assignment drawings. (for FGD Control building elevators)







**SCHEDULE OF EXTERNAL FINISHES**

NO.	DESCRIPTION	REMARKS
1	WALLS	20 MM THK. WITH 1:4 CEMENT SAND MORTAR
2	PLASTER	12MM THK WITH 1:4 CEMENT SAND MORTAR
3	CEILING	3MM WHITE CEMENT PUTTY
4	FINISHING	EXTERNAL QUALITY ACRYLIC EMULSION PAINT.

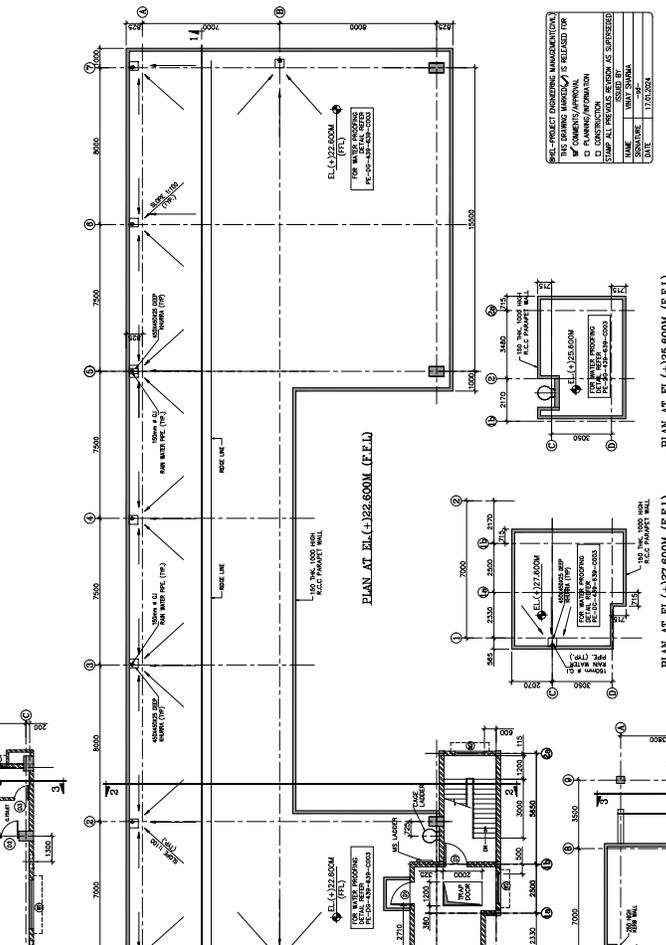
**SCHEDULE OF DOORS**

SYMBOL	MARKET OPENING	LEVEL AT EL.	REMARKS
1	1500 x 2100	EL+12.000M	DOUBLE SHUTTER FIRE PROOF DOOR
2	1500 x 2100	EL+12.000M	SINGLE SHUTTER FIRE PROOF DOOR
3	1500 x 2100	EL+12.000M	DOUBLE SHUTTER ALUMINUM GLAZED DOOR WITH 6MM THK TOUGHENED FLOAT GLASS
4	1500 x 2100	EL+12.000M	SINGLE SHUTTER ALUMINUM GLAZED DOOR WITH 6MM THK TOUGHENED FLOAT GLASS
5	900 x 2100	EL+12.000M	SINGLE SHUTTER WOODEN PANEL DOOR WITH 18MM THK TOUGHENED FLOAT GLASS
6	900 x 2100	EL+12.000M	SINGLE SHUTTER SOLID CORE PVC DOOR
7	1500 x 2100	EL+12.000M	SINGLE SHUTTER FLOW METAL (STEEL) FLUSH DOOR
8	3000 x 3000	EL+12.000M	ROLLING SHUTTER

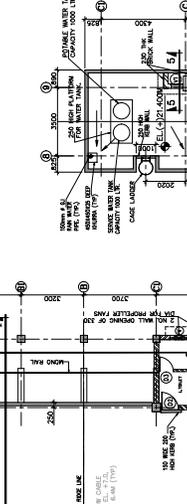
**SCHEDULE OF WINDOWS & VENTILATORS**

SYMBOL	MARKET OPENING	LEVEL AT EL.	REMARKS
1	1500 x 1500	EL+12.000M	STEEL WINDOW PARTLY OPENABLE & PARTLY FIXED-WITH 4MM THK CLEAR FLOAT GLASS.
2	2500 x 1500	EL+12.000M	ALUMINUM GLAZED WINDOW PARTLY OPENABLE & PARTLY FIXED-WITH 4MM THK CLEAR FLOAT GLASS.
3	1500 x 1500	EL+12.000M	STEEL WINDOW PARTLY OPENABLE & PARTLY FIXED-WITH 4MM THK CLEAR FLOAT GLASS.
4	1500 x 1500	EL+12.000M	ALUMINUM GLAZED TOP HANG WITH 4MM THK GROUND GLASS.
5	600 x 400	REF. ELEVATION	SINGLE SHUTTER FLOW METAL (STEEL) FLUSH DOOR
6	2500 x 600	REF. ELEVATION	ALUMINUM GLAZED TOP HANG WITH 4MM THK GROUND GLASS.

The information on this drawing is the property of the client and is to be used only for the project and site mentioned herein. It is not to be used for any other project or site without the written consent of the client. The client shall be responsible for the accuracy of the information provided to the consultant. The consultant shall not be held responsible for any errors or omissions in the drawing.



- NOTES:**
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION.
  - ALL DIMENSIONS ARE IN MM. AND LEVELS ARE IN M UNLESS NOTED OTHERWISE.
  - OF POWER HOUSE BUILDING ALL TYPES. WHICH IS THE PROPOSED GROUND LEVEL.
  - ALL GROUND FLOOR WINDOWS SHALL BE WITH DAMPING GRILL.
  - FOR OTHER GENERAL ARCHITECTURAL NOTES REFER DRAWING NO. PE-DC-439-693-C003.
- REFERENCE DRGS:**
- PE-DC-439-693-C001
  - PE-DC-439-693-C002
  - PE-DC-439-693-C003
  - PE-DC-439-693-C004
  - PE-DC-439-693-C005
  - PE-DC-439-693-C006
  - PE-DC-439-693-C007



**CLIENT:** TELANGANA STATE POWER CORPORATION CORPORATION LTD.  
HYDRABAD, TELANGANA, INDIA

**DESIGNER:** DEEPAK ENGINEERING CONSULTANTS PVT. LTD.  
KOTLAGUDA POND, KOLATA

**PROJECT:** STAGE-VII UNIT # 12 (1800 MW) REBUILT HEAVY ELECTRICALS BLDG. PROJECT CONSULTING SERVICES FOR FGD CONTROL ROOM BUILDING ARCHITECTURAL PLAN

**DATE:** 17/03/2024

**SCALE:** AS SHOWN

**DRAWING NO.:** PE-DC-439-693-C001

**READ THIS DRG. IN CONJUNCTION WITH DRG. PE-DC-439-693-C002**

**PLAN AT EL.+121.400M (F.F.L.)**

**PLAN AT EL.+118.400M (T.O.C.)**

