

**RAICHUR POWER CORPORATION LIMITED**  
(A JVC OF KPCL & BHEL)  
**2X800 MW YERAMARUS SUPERCRITICAL TPP**

**VOLUME - II B & III**

**TECHNICAL SPECIFICATION  
FOR  
ELEVATOR**

**SPECIFICATION NO. PE –TS–362 - 502 – A001**



**BHARAT HEAVY ELECTRICALS LIMITED**  
**POWER SECTOR**  
**PROJECT ENGINEERING MANAGEMENT**  
**NOIDA, U.P**  
**INDIA**



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**SCOPE OF ENQUIRY**



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### SCOPE OF ENQUIRY

#### 1.0 INTENT OF SPECIFICATION

- 1.1 This specification covers the design, manufacture, inspection and testing at manufacturer's works, painting, packing suitable for coastal atmosphere and delivery to site of elevator package for 2X800 MW YERAMARUS SUPERCRITICAL TPP at Raichur District Karnataka.
- 1.2 It is not the intent to specify all the details of design and manufacture. However, the equipment shall conform 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 judgment is not in accordance herewith.
- 1.3 Deviation, if any, should clearly be brought out, otherwise, it will be presumed that the bidder's offer is strictly in line with the specification.
- 1.4 The general terms and conditions, instructions to contractor and other attachment referred to elsewhere are hereby made part of the tender specification. The contractor shall be responsible for and governed by all requirements stipulated hereinafter.
- 1.5 In the event of conflict between different clauses of mechanical, electrical, civil and C & I requirement specified in the specification of **ELEVATOR**, the more stringent requirement as per the interpretation of the owner shall apply and the same shall be adhered and provided by the bidder during detail engineering stage without any commercial implication.
- 1.6 In the event of any conflict between the requirements of this specification and the requirements of relevant codes and standards, the more stringent requirement as per the interpretation of the owner shall apply and the same shall be adhered and provided by the bidder during detail engineering stage without any commercial implication.



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**PROJECT INFORMATION**

## EXECUTIVE SUMMARY

### 1.1 PURPOSE

Karnataka Power Corporation Limited (KPCL) propose to set up a coal-based 2x800 MW, Thermal Power Station at Yermaras, Raichur District, Karnataka State.

The objective of the study is to establish the need for this project, detailing out the feasibility of the project, clearances and studies required to be carried out, the techno-economic justification for selection of Plant and equipment, financial analysis for arriving at the cost of generation, expenditure phasing, return on investment etc.

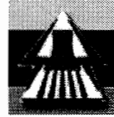
This DPR would be the input document towards project appraisal, statutory clearances and also serve as a bankable document for financial institution approvals.

### 1.2 SALIENT SITE DETAILS

The project is proposed to be set up on the Karnataka Industrial Area Development Corporation (KIDC) land allotted to KPCL. 836 acres of land has already been allotted with negotiations on for additional allotment of about 245 acres land. This allotted plot is near the Chiksugar, Wadloor and Yermaras villages by the State Highway SH-13 and about five (5) kilometers from the existing Raichur Thermal Power Plant site towards Raichur town. Chiksugar Railway station is 2kms away, the nearest airport is at Hyderabad around 260 kms. away and the nearest port is at Vasco around 625 kms from the site. Power evacuation will be through the Transmission net work of KPTCL.

Water will be drawn from the jack wells in the Krishna River with the water pipelines following the existing route upto Raichur TPS. Adequate water availability is ensured with the allotted water quantity to KPCL: the water requirement for the 2x800MW units, Yermaras Thermal Power Station is 7210m<sup>3</sup>/hr.

The source of coal would be primarily domestic coal from Singareni, South East and Mahanadi coalfields. The annual coal requirement at MCR and 85% Load



Factor is estimated at 5.83 MTA based on a gross calorific value of 4699 kcal/kg and heat rate of 2300kcal / KWh.

### **1.3 PROJECT JUSTIFICATION**

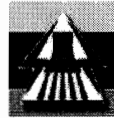
Survey carried out earlier indicates that over 40 % of the households in the region do not have power; those who have electricity face frequent power failures and the challenge is to provide electricity in a sustainable manner at reasonable cost. If Karnataka State is to be free of power shortages, substantial amount of installed capacity will be required over and above the Eleventh Plan targets. In view of the present day uncertainty in implementation of the power projects owing to location, capacity and fuel allocations, this project will help bridge the gap between demand and supply of power in Karnataka.

### **1.4 TECHNO- ECONOMIC CONSIDERATIONS**

Important factors which influenced site selection are existing infrastructure, techno-economic and environmental considerations.

The basic requirements of land, water, coal availability and its transportation as well as power evacuation are well met by the site selected for the 2x800 MW Yermaras Thermal Power Station. A distinct advantage for this site is the fact that the land is already allotted to KPCL thereby effecting invaluable saving in time and money in land acquisition proceedings. Another advantage for this site is the sharing of some common facilities with the Raichur Thermal Power Project in the vicinity. The existing Raichur TPS township is capable of accommodating the personnel for this project and no separate township is required. With the stringent norms for ash disposal, any ash disposal in exigency conditions would be to the existing ash dykes of Raichur TPS. Hence pipelines shall be laid following the existing route for both ash as well as for water.

Infrastructural facilities also exist for coal transportation. Presently coal is being brought from the mines for Raichur TPS on rail route to Yedlapur railway station from where the rail siding takes off for Raichur project. Chiksugar station on SCR is the nearest station for Yermaras project.



From techno-economic considerations the 800 MW units have been preferred over 500 MW units. The higher capital cost of the 800 MW super critical units would be offset by the efficiency advantage of 800 MW units over the 500 MW sub-critical units.

The steam generators shall be of assisted circulation type, tangentially fired, super critical, balance draft, single reheat, controlled circulation dry bottom, top supported and of two pass design. The BMCR gross generation capacity shall be 2575 T/hr at 568 deg. The turbine shall be multi-stage, multi-cylinder, impulse, tandem compound, single reheat, double flow LP, condensing type design with a gross TMCR of 800 MW and 3000 rpm rated speed.

A functionally distributed microprocessor based DCS, designed for CRT operation, control and monitoring with in-built Sequence of Events (SER) recording and Annunciation system including control desk and system cabinets shall be provided. Plant operation and control shall be through the Operator Work Stations (OWS) located on the Unit Control Desk (UCD) in the Central Control Room.

It will be ensured that the environmental pollution from the Plant is in compliance with the acceptable pollution levels prescribed by the Pollution Control Board and the Ministry of Environment & Forests.

The measures proposed to contain possible environmental pollution are as follows:

- i. Atmospheric pollution to be minimized by providing a chimney of 275M height to enable dispersion of heat as well as the SPM, SO<sub>x</sub> and NO<sub>x</sub> levels of the gaseous emissions.
- ii. Heat dissipation to atmosphere is also minimized through the closed cycle system with cooling towers.
- iii. Providing electrostatic precipitators with an efficiency in the range of 99.8 % to limit the particulate emissions to within 50 mg/Nm<sup>3</sup>.
- iv. Provision of space for Flue Gas De-sulphurisation (FGD) in case required to restrict the SO<sub>x</sub> to within permissible limits.
- v. Dust suppression system as required to contain the dust nuisance in the coal handling & ash handling areas: sprinklers provided to contain the



flying dust: and in the ash dyke area standing water to prevent flying of ash particles when ash slurry dries up.

- vi. Ecological balance is proposed to be maintained by providing a green belt of 50 meters all around the plant periphery besides the overall green belt area kept at minimum one-third of total project area.
- vii. Noise levels within 85 dB ensured by providing acoustic dampers, cladding enclosures etc.

## **1.5 PROJECT IMPLEMENTATION**

The project is to be implemented through EPC / non-EPC contractors selected through competitive bidding process, terms & conditions and time schedule as well as based on experience, technical soundness etc.

The time period for execution of work has been considered as 48 months for Unit#1 from the zero date viz. date of signing of contract with the EPC contractor and 54 months for Unit #2.

## **1.6 CONCLUSIONS**

This detailed study has carried out an in – depth assessment of all aspects of the project. This is a viable project, which has the potential to go on fast track with the land already allotted by KIADB to KPCL. A significant amount of time and money, which would normally have been spent in land acquisition proceedings and litigations, has been thus saved.

The site has been selected considering techno-economic, infrastructural and environmental considerations. The project capital cost works out to be million Rs.88062.30. If the project is accorded mega power status by the government, then the total project capital costy works out to million Rs.79823.23. The levellised tariff for 25 years works out to Rs.3.24/ kWh without mega power project status and Rs.3.12 with mega power project status.

## **1.0**

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## SPECIFIC TECHNICAL REQUIREMENTS



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## 1.0 Introduction

Passenger elevator shall be provided for access to various operating floors / platforms in TG hall, and Service building to facilitate movement of operating and maintenance personnel.

## 2.0 Scope of equipment supply and services


**2.0.1** Design, Engineering, Manufacture, Inspection & Testing at manufacturer's works or at their sub-vendor's works, Painting at manufacturer's or at their sub-vendor's works, duly packed for transportation to site, delivery to site, storage and handling at site, Erection & Commissioning, carrying out trial run and Acceptance / PG Tests at site & final painting of Passenger Elevators for 2 x 800 MW YERAMARUS STPP as listed below:-

Sl. no	Building	No. of elevators	Capacity	No. of landings	Total rise	Type	Rate
1)	TG Hall	2 Nos.	884 Kg	0.0m, 8.5m, 17.0m, 24.5m, 29.5m, 33.0m & 40.0m.	40 M	Conventional (Simplex)	1.0 M/s
2)	Service Building	2 Nos.	884 Kg	0.0m, 4.25m, 8.5m, 12.75m, and 17.0m.	17M	Conventional (Simplex)	1.0 M/s

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

- 1) Elevator car.
- 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) Car doors and hoist way doors.
- 9) Car operating panel, digital control, car position indicator at all floors, luminous hall buttons, auto door operating mechanism, alarm bell, car light & car fan.



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10)

Intercom connection.

11)

Ropes for hoisting.

12)

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.

13)

Ladder in pits.

14)

Emergency light with rechargeable battery.

15)

All fixing materials require to fix rails, brackets, equipment including nuts and bolts.

16)

Facia plates and still angels.

17)

ELCB if required as per statutory requirement.

18)

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

19)

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

20)

Mirror.

21)

Music system to be provided.

22)

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

23)

Void

24)

Maintenance tools and tackles along with un-priced list with the offer.

25)

Minor civil work required during installation of elevator.

26.


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

27.

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.

28.


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

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29. Guide rails complete with supporting brackets for the car and counter weights.
30. 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. Bidder shall provide hoist and hoisting beam in the machine room ceiling.
31. Any other steel works as well as all other accessories / components not specified in the technical specification but necessary for making the elevator complete.
32. All minor building works including the supply of steel items, associated with installations of equipments in the machine room hoist way, hoist way door, frames and elevator pit, shall form part of bidder's scope of supply, BHEL / customer will provide the elevator well complete with foundation and brick walls around the lift well together with overhead machine room. The machine room will be provided with RCC floor slab with necessary pockets for anchor bolts and slots.


**NOTES:**

- 1) Blank.
- 2) Flooring for all passenger type elevators shall be vitrified ceramic tile of matt finish or PVC flooring as indicated in the Data sheet except for Goods cum Passenger elevators which shall be chequered plate.
- 3) Bidder shall submit the type and capacity of air conditioner required for machine room in the technical bid. However, successful bidder shall furnish the heat load calculation and capacity of air conditioner after considering all actual heat loads of m/c room during detail engineering stage for BHEL's reference and record.
- 4) Panoramic type elevator (if specified in the specification) shall be either capsule type or 5 sided glass panel as per the customer requirement.
- 5) Functional Guarantee test shall be carried out at site for over speed test and over load test (@ 1.25 times of design load), travel and hoist speed checks.
- 6) Car, landing door and car ceiling shall be of SS-304 sheet with thickness (min) 1.5 mm.
- 7) Bidder shall fill the electrical load data for each project separately as per the format provided in the specification

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8)	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 IS 14665 (Relevant part).
9)	All Equipments / facilities needed for erection commissioning shall be in bidder's scope.
10)	Bidder to note that all LT Power cables (Fixed power and control cables etc), Trailing cable and instrument / signal cable for elevator shall be in bidder's scope as per electrical specification. Trailing cable shall be FRLS type (with strain bearing member).
11)	Make of various bought out items & QAP shall subject to approval of BHEL / Customer during detail engineering stage.
12)	Bidder shall provide all required spares during E & C without any commercial implication.
13)	Bidder to provide ARD (Automatic rescue device) and voice synthesizer for floor announcement and background music for each elevator mentioned above.
14)	Car frame and structure (guide brackets, supports etc) shall be painted with epoxy based paint for all elevators.
15)	Protection class for motor shall be IP 54 and main control panel shall be min IP 21 and elevator control shall be VVVF type. Push buttons, Car operating Panel, Landing Operating Panel, Landing door motor and other equipment shall be IP-54.
16)	Factor of safety for rope shall be 12 (min).
17)	All Landing door shall be fire rated for at least 1 Hour as per BS.
18)	Motor shall be S4 duty with insulation class F.
19)	Infrared Curtain safety feature in door.
20)	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

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- 21) 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.
- 22) Bidder shall provide equipment as per requirements indicated in this specification, statutory and regulatory requirements, and prevailing local lift act requirements.
- 23) 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.
- 24) 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.
- 25) Bidder shall include scaffoldings required in their scope of work.
- 26) Elevator shall be provided with AC VVVF type drive control system.
- 27) All equipment shall be treated with anti corrosive paint / zinc plating.

Scope demarcation:-

S. No	Civil scope	Electrical Scope	Remarks
1)	BHEL / customer except minor civil like grouting etc which shall be in bidder's scope	Shaft and M/c room lighting by bidder.	Car lighting by bidder.


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

- 1) Electrical load list for each elevator
- 2) Deviation schedule (if any)
- 3) GA of elevator with Pit, shaft, M/c room details and motor power calculation for all types and capacities of elevator
- 4) Void
- 5) Signed and stamped copy of Electrical scope matrix and electrical specification
- 6) Signed and stamped copy of Specific confirmation sheet (Annexure – II).
- 7) Capacity of air conditioner for machine room and hoist

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

### 3.0 SCOPE OF SERVICES

Scope of services will broadly include the followings:-

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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

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)

PG 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 GTR, GCC, ECC & SCC.

11)

Window / split type air conditioner or pressurized ventilation in the machine room which includes fans, air filter and accessories to prevent dust ingress in the machine room.

12)

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

4.0

Exclusion

1)

Window / split type air conditioner or pressurized ventilation in the machine room which includes fans, air filter and accessories to prevent dust ingress in the machine room

2)

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

3)

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

4)


Hoist-way Lighting and machine room lighting

5)

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

6)

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 collective, automatic operation with or without attendant through illuminated push button station located inside the lift car.
- b) Door operating shall be automatic door operation and electronic door protection system for opening / closing of car and landing doors.
- c) Bidder shall provide car operating panel with luminous buttons, car position indication in car (both visual and audio) combined with direction arrows, overload warning indicator, battery operated alarm bell and emergency light and fan and hands free speaker telephone set with suitable battery, charger and controls.
- d) Bidder shall provide emergency indicator to indicate the location of elevator in case of elevator being stuck up between the floors through automatic flashers (both audio and visual).
- e) Bidder shall provide electronic door detector (infrared curtain type).
- 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 (+3% to -5% variation) supply. Motors shall be provided with class F insulation.

All motors applicable for the package shall be energy efficient motor (Energy Efficient-1 as per IS 12615)

## 7.0 Controls

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

## 8.0 Cables and wirings

The cables used in the elevator installations shall conform to the latest edition of IS 4289. All wiring / cabling between the equipments in the lift machine room



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and that between the machine room and equipment in the lift well and at the landing shall be wired in HDP conduits / galvanised steel conduits to be supplied by the bidder. Alternatively, armoured cables may be used. However, bidder shall refer detailed specification of cables / wirings elsewhere in the specification.


## **9.0 Earthing**

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

## **10.0 DESIGN CRITERIA**

The design criteria and equipment specification will be as follows:


- i) The rated speed will be one (1) m/sec. Proper allowance will be made for impact and wear and the factor of safety for rope shall not be less than twelve (12) or as per IS 14665 (all parts). The suspension wire rope will confirm to IS-14665 or approved equivalent international standard.
- ii) The lift will be providing with automatic travelling device which will take care of overrun and under run of the car and rope stretch that the car floor is within 6.0 mm from the landing level at the floors while in operation.
- iii) The lift will be equipped with upper and lower terminal switches arranged to stop the car automatically within the limit of the top car clearance and bottom run-by, from the any normal operating speed.
- iv) The elevator car shall be provided with SS-304 sheet fabricated, bright finished to approved shade (including landing doors of the car). Vitrified ceramic tile of matt finish flooring / PVC flooring as indicated in the data sheet - A, concealed fan and indirect lighting, emergency lighting, intercom, car position and travel direction indicator.
- v) As the elevator is to provide service in a power station, it is necessary for the equipment to be specially coated (painted). This will include application of anticorrosive paint as applicable. The electrical equipment will have enclosures meeting degree of protection as covered under electrical specification.
- vi) The elevator as a whole will comply with relevant Indian Standard i.e. 14665 or approved international standard. The outline dimensions of electric lift shall meet the requirements of IS 14665 (latest edition).
- vii) The elevator shall be provided with AC VVVF type drive control system.
- viii) Doors are automatic, center opening with emergency key opening at all landings, horizontal sliding type for car as well as for hoist way. Trap door shall be provided as per IS-14665 (latest edition).

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### 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) C&I requirements shall be as per requirements enclosed elsewhere in the specification.
- 4) Dealers are not acceptable for any item of the package. Bidder shall procure all items from BHEL / customer approved sub vendor only. No argument on this account shall be entertained.
- 5) Complete elevator installation shall be in accordance with the requirements of concerned approving authority.
- 6) 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.
- 7) 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.
- 8) 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.
- 9) 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.
- 10) O & M manual shall be furnished to BHEL / customer / consultant for approval during detailed engineering stage.
- 11) 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.



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12) 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.

13) 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.

14) Bidder to note that all the drawings shall be prepared in Auto Cad - 2010 version and required number of hardcopies and soft copies shall be furnished to BHEL during detailed engineering stage. Exact requirement of number of hard copies and soft copies of all drawings and documents as required by BHEL / customer / consultant shall be informed to the successful bidder during detail engineering stage and bidder to furnish the same for which no additional cost shall be entertained.

15) 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.

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

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


b) Recommended locations of earthing pads.

c) Civil loads along with detailed calculation of loading

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

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

18) 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.

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

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

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

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

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

20) 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.


21) 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.


22) Bidder shall check that specification 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.

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

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

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

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<p>26) 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.</p> <p>27) The General Technical Requirements shall be as per GTR enclosed elsewhere in the specification.</p> <p>28) Commercial implication includes price implication as well as delivery implication.</p> <p>29) Dummy landing/s, as required in case travel between two consecutive landing is more than 10 m, shall be considered by bidder in his offer.</p>			

	<b>TITLE</b> <b>TECHNICAL SPECIFICATION of VVVF drive for</b> <b>Elevator</b>	SPECIFICATION NO. PE-TS-362-502-A001	
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## 1.0 General

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

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

- c) Programming of VVVF Drives.

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

- d) VVVF drives shall be connected with power supply and these drives generate their own low voltage control supply. Potential free contacts shall be connected to this control supply and few programmable control terminals. Starting / stopping / set speeds operations of VVVF drive shall be achieved by above control connection.
- e) VVVF shall give smooth control over acceleration and deceleration making the motion jerk free and using Variable voltage variable frequency limits the inrush current to the squirrel cage motors. VVVF provides controlled torque to the motor due to which elevator operations are jerk free.

## 1.1 Experience

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

## 1.2 Local support

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



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

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

## **2.0 Basic requirements for the AC Drives**

### **2.1 General requirements**

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

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

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

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

Rated Input Voltages	380V -15% 480V +10%, three-phase
Rated Input Frequency	50Hz +/- 5%
Output Voltage	0 – Input voltage, three-phase
Output Frequency Range	0 to 400 Hz
Acceleration / Deceleration Time	0.01 – 999s, adjustable, linear, with S, with U or customised shapes
Overload capability (Constant Torque)	150% of nominal current for 1min.
Operating ambient Temperature	-10°C up to 50°C (shall be derated suitably if not rated at 50°C)
Storage ambient Temperature	-25°C up to 70 °C



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

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

**Suitable encoder shall be provided for main hoist motion.**

### 3.0 User interface

#### 3.1 General

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

#### 3.2 Inputs and outputs

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

Analyse Inputs	:	1 x Programmable differential voltage input $\pm 10V$ , 1 x Programmable current input 0(4) - 20mA 1 x Programmable voltage input 0 – 10V
Analyse Output	:	1 x Programmable analogue outputs 0(4) - 20mA or 0 – 10V
Logic inputs	:	6 x Programmable logic Inputs isolated from the mains
Relay Outputs	:	2 x Programmable Digital outputs with a changeover dry contact

All the control terminals shall be clearly marked.

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



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

### 3.4 Programming terminal


- A. The AC drive shall have a keypad /display for programming and controlling purposes. An IP54 or IP65 remote mounting shall be possible at a distance of 10m.
- B. Password protection shall be provided to avoid unauthorized tampering with the set parameters.
- C. The programming terminal shall be able to display the commercial reference of the AC drive and of the options, the software version, the serial number
- D. Direct keypad entry shall be provided to observe the following actual parameters. Any one of the following parameters or actual values shall be selected to be always displayed :-
  - i) Input Voltage
  - ii) Input Frequency
  - iii) Output Frequency
  - iv) Output Power
  - v) Output Current
  - vi) Motor Speed

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

- i) Drive Status

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

- i) Run

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ii) Stop

iii) Local / Remote selection.

iv) Forward/Reverse (if function enabled)

v) Accelerate

vi) Decelerate

vii) Parameter setting

3.5

Application programming

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

3.6

PC Tools

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

4.0

Software features

A.

Restart

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

B.

Brake logic control


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

5.

Preferred makes:

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



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**ANNEXURE – II**

**Drawings / documents distribution schedule**

**DRAWINGS AND DOCUMENTS REQUIREMENT**

S. NO.	DESCRIPTION OF MANUALS	NO. OF PRINTS	NO. OF CD (SETS)
1	PLANT DEFINITION MANUAL		3
2	DRAWINGS FOR APPROVAL	9	3
3	DRAWINGS FOR INFORMATION	9	3
4	FINAL DRAWINGS	15	3
5	AS BUILT DRAWINGS	15	3
6	DATA SHEETS, DESIGN CALCULATIONS, PURCHASE SPECIFICATIONS AND OTHER TYPE OF DOCUMENTS		
6.1	FOR APPROVAL	9	3
6.2	FINAL	15	3
6.3	ANALYSIS REPORT OF EQUIPMENTS / PIPING / STRUCTURES / SYSTEMS EMPLOYING SOFTWARE PACKAGES AS DETAILED IN SPECIFICATION		
6.3.1	INPUT	9	3
6.3.2	OUTPUT	9	3
6.3.3	DRAWING / SKETCHES	9	3
7	ERECTION MANUAL - FINAL		3
8	OPERATIONS AND MAINTENANCE MANUAL - FINAL		3
9	PLANT HAND BOOK - FINAL		3
10	COMMISSIONING AND PERFORMANCE PROCEDURE MANUAL - FINAL		3
11	PERFORMANCE AND FUNCTIONAL	9	3
12	PROGRESS REPORTS	9	3
13	PROJECT COMPLETION REPORT	15	3
14	QA PROGRAMME INCLUDING ORGANIZATION FOR IMPLEMENTATION AND QA SYSTEM MANUAL	1	1
15	VENDOR DETAILS IN RESPECT OF PROPOSED VENDORS INCLUDING CONTRACT EVALUATION REPORT	1	1
16	MQP AND FIELD QPs, FIELD WELDING SCHEDULES AND THEIR REFERENCE DOCUMENTS LIKE TEST PROCEDURES, WPS, POR ETC.		
16.1	FOR REVIEW / COMMENTS	3	1
16.2	FOR FINAL APPROVAL	4	1
17	WELDING MANUAL, HEAT TREATMENT MANUAL, STORAGE AND PRESERVATION MANUALS		
17.1	DRAFT	4	
17.2	FINAL	4	2
18	MONTHLY VENDOR APPROVAL AND QP APPROVAL STATUS	2	1
19	QP DOCUMENTATION PACKAGE FOR ITEMS / EQUIPMENTS MANUFACTURED AND DEPARTED TO SITE	2	2
20	QA DOCUMENTATION PACKAGE FOR FIELD ACTIVITIES ON EQUIPMENT / SYSTEMS AT SITE	2	2

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**NOTE :** THE ABOVE ARE THE MINIMUM QUANTITY OF DRAWINGS/DOCUMENTS REQUIRED.THE EXACT REQUIREMENT SHALL BE INFORMED TO THE SUCCESSFUL BIDDER DURING DETAIL ENGINEERING SATGE FOR WHICH NO COMMERCIAL IMPLICATION SHALL BE ENTERTAINED BY BHEL.



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S.No.	DESCRIPTION	PASSENGER ELEVATOR
1.	Elevator	Power House Building
2.	Type of Service	Passenger Type
3.	Rated Load on Elevator	884 Kg. ( 13 Person)
4.	Quantity	Two (2) No. for Power House building.
5.	Rated Speed of Lift	1.0 M/Sec
6.	Total Travel	40 M
7.	Nos. of floors to be served	Seven (7) Nos. including Ground
8.	Method of control	ACVVVF Control with automatic level adjustment.
9.	Position of Machine Room	Directly above the lift Shaft.
10.	Car enclosure construction, design and finish car	SS -304, 1.5 mm thk. sheet,
11.	Design, construction, installation codes including car size, door size, Shaft size, Size of platform and car entrance	As per IS: 14665 (all parts), latest edition
12.	Car and landing door	Horizontal bi-parting door
13.	Flooring	PVC flooring
14.	Operation	Automatic simplex collective with and without attendant with provision for locking control in "auto" or "Attendant" position. Key type lock switch shall be provided.
15.	Signal	Car position indicator in car, car position indicator at car floors, telltale lights at all floors, battery operated alarm bell and emergency light with suitable battery, battery charger and controls, Remote alarm shall be provided.
16.	Method of operation of car and landing doors.	Power operated with automatic door opening and closing devices.
17.	Lighting & fan	One cabin fan, two recessed fluorescent lamp fittings of lux level : 100 min.
18.	Power supply : a) Power b) Lighting & fan	415 Volts, 3 Phase, 50 c/s, 4 wire system 240 Volts, 1 Phase, 50 c/s
19.	Other requirements	Internal telephone wiring and telephone hand set to be provided. The external connection shall be provided by RPCL Also, automatic rescue device shall be provided.
20.	Additional requirements :-	
a)	Isolating cushion between car and car frame shall be provided.	Type of cushion shall be rubber pad or spring which shall be as per manufacturer's standard.
b)	Three pin plug with socket on car	5/15A, socket with switch on top of lift car.

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	top	
c)	Car frame Material and type of construction	Steel and bolted construction
d)	Landing Door	Fire rated for min. 1 hour
e)	Type of operation	Automatic
f)	Door hanger tracks along with accessories shall be provided.	Required
g)	Safety shoes complete with accessories shall be provided.	Yes
h)	Safety device for door operation shall be provided.	Infrared light curtain is required.
i)	Handrails on three sides	Mirror stainless steel
j)	False ceiling	Powder painted
k)	Emergency stop switch	
21.	Control and operation	
	(a)Type of control	Simplex
	(b)Type of drive	Variable voltage variable frequency drive
22.	Car operating panel	Provided
	(a)Type of construction	Partial Height car operating panel (COP), Removable type from Car with SS face plate
	(b)Push Buttons	Luminous push buttons with IP 54
23.	Car position indicator	Provided
	(a)Type of construction	As per manufacturer's standard
	(b)Type of display	7 segment LED display
24.	Push button station and call registered tell tale lights at each landing	Provided in each landing
	(a)Type of construction	Box type with SS face plate
	(b)Push Buttons	Luminous push buttons with IP 54
25.	Apron / Facia Plate provided as per IS 14665	Yes (To be provided by supplier)
26.	Emergency Light	Required
27.	Terminal buffers, their types and number of buffers	Spring buffers shall be Provided as per IS 14665.
28.	Load plate	As per manufacturer's standard / as applicable
29.	Counter weights frame	Fabricated Steel Construction
30.	Counter weight fillers	Cast Iron
31.	Number of Limit Switches	As per requirement
	a) Location	Bottom & top terminal
	b) Type	Electromechanical
	c) Operation	Cam Operated
32.	Controller and type	Selective Collective Controller with variable voltage variable frequency drive and Microprocessor based software controlled logic system
33.	Reverse phase relay and other	Required



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	protective devices	
34.	Car Safety & Governor	
	a) Stopping distance	As per IS:14665.
	b) Type and mode of operation of Over speed Governor device	Centrifugal action
	c) Tripping speed and design code conforming to	As per IS 14665
	d) Location	At machine room
35.	Motor details	
	(a) Type	3 phase AC squirrel Cage Induction motor
	(b) Type of Duty	Lift Duty
	(c) Motor Duty	S4
	(d) Duty Cycle of Motor	60%
	(e) Applicable standard	IS:325
	f) No. Of Starts Per Hour	Elevator Motor shall be suitable for minimum of 150 Starts per hour
	g) Direction of rotation	Both Clockwise & Anticlockwise
	h) Class of Insulation	F
	i) Method of Starting	AC Variable Voltage Variable Frequency Drive
36.	Door Motor	
	a) Equipment driven by Motor	Door
	b) Direction of rotation	Both Clockwise & Anticlockwise
	c) Type of enclosures	IP54
37.	Metallic Wire Mesh between Car & Counter Weight	Required
38.	Fire Man Switch	Required
39.	Sound Reducing Material	Isolation Rubber / other arrangement in the Machine shall be provided
40.	Automatic Rescue Device	Provided
41.	Trailing cables	FRLS type
42.	Design seismic coefficient	According to IS 1893 - 1977


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S.No.	DESCRIPTION	PASSENGER ELEVATOR
1.	Elevator	Service Building
2.	Type of Service	Passenger Type
3.	Rated Load on Elevator	884 Kg.( 13 Person)
4.	Quantity	Two (2) No. for Service Building
5.	Rated Speed of Lift	1.0 M/Sec
6.	Total Travel	17 M
7.	Nos. of floors to be served	Five (5) Nos. including Ground
8.	Method of control	ACVVVF Control with automatic level adjustment.
9.	Position of Machine Room	Directly above the lift Shaft.
10.	Car enclosure construction, design and finish car	SS -304, 1.5 mm thk. sheet,
11.	Design, construction, installation codes including car size, door size, Shaft size, Size of platform and car entrance	As per IS: 14665 (all parts), latest edition
12.	Car and landing door	Horizontal bi-parting door
13.	Flooring	PVC flooring
14.	Operation	Automatic simplex collective with and without attendant with provision for locking control in "auto" or "Attendant" position. Key type lock switch shall be provided.
15.	Signal	Car position indicator in car, car position indicator at car floors, telltale lights at all floors, battery operated alarm bell and emergency light with suitable battery, battery charger and controls, Remote alarm shall be provided.
16.	Method of operation of car and landing doors.	Power operated with automatic door opening and closing devices.
17.	Lighting & fan	One cabin fan, two recessed fluorescent lamp fittings of lux level : 100 min.
18.	Power supply : a) Power b) Lighting & fan	415 Volts, 3 Phase, 50 c/s, 4 wire system 240 Volts, 1 Phase, 50 c/s
19.	Other requirements	Internal telephone wiring and telephone hand set to be provided. The external connection shall be provided by RPCL. Also, automatic rescue device shall be provided.
20.	Additional requirements :-	
a)	Isolating cushion between car and car frame shall be provided.	Type of cushion shall be rubber pad or spring which shall be as per manufacturer's standard.
b)	Three pin plug with socket on car	5/15A, socket with switch on top of lift car.

	<b>TITLE:</b>  <b>DATA SHEET - A</b> <b>FOR</b> <b>ELEVATOR</b>	<b>SPECIFICATION NO. PE-DC-361-502-A001</b>	
		<b>VOLUME IIB</b>	
		<b>SECTION D</b>	<b>SUB-SECTION</b>
		<b>REV. 00</b>	<b>DATE: 14/11/2011</b>
		<b>SHEET 2 OF 3</b>	

	top	
c)	Car frame Material and type of construction	Steel and bolted construction
d)	Landing Door	Fire rated for min. 1 hour
e)	Type of operation	Automatic
f)	Door hanger tracks along with accessories shall be provided.	Required
g)	Safety shoes complete with accessories shall be provided.	Yes
h)	Safety device for door operation shall be provided.	Infrared light curtain is required.
i)	Handrails on three sides	Mirror stainless steel
j)	False ceiling	Powder painted
k)	Emergency stop switch	
21.	Control and operation	
	(a) Type of control	Simplex
	(b) Type of drive	Variable voltage variable frequency drive
22.	Car operating panel	Provided
	(a) Type of construction	Partial Height car operating panel (COP), Removable type from Car with SS face plate
	(b) Push Buttons	Luminous push buttons with IP 54
23.	Car position indicator	Provided
	(a) Type of construction	As per manufacturer's standard
	(b) Type of display	7 segment LED display
24.	Push button station and call registered tell tale lights at each landing	Provided in each landing
	(a) Type of construction	Box type with SS face plate
	(b) Push Buttons	Luminous push buttons with IP 54
25.	Apron / Facia Plate provided as per IS 14665	Yes (To be provided by supplier)
26.	Emergency Light	Required
27.	Terminal buffers, their types and number of buffers	Spring buffers shall be Provided as per IS 14665.
28.	Load plate	As per manufacturer's standard / as applicable
29.	Counter weights frame	Fabricated Steel Construction
30.	Counter weight fillers	Cast Iron
31.	Number of Limit Switches	As per requirement
	a) Location	Bottom & top terminal
	b) Type	Electromechanical
	c) Operation	Cam Operated
32.	Controller and type	Selective Collective Controller with variable voltage variable frequency drive and Microprocessor based software controlled logic system
33.	Reverse phase relay and other	Required



	<b>TITLE:</b>  <b>DATA SHEET - A FOR ELEVATOR</b>		SPECIFICATION NO. PE-DC-361-502-A001	
			VOLUME IIB	
			SECTION D	SUB-SECTION
			REV. 00	DATE: 14/11/2011
SHEET 3 OF 3				

	protective devices	
34.	Car Safety & Governor	
	a) Stopping distance	As per IS:14665
	b) Type and mode of operation of Over speed Governor device	Centrifugal action
	c) Tripping speed and design code conforming to	As per IS 14665
	d) Location	At machine room
35.	Motor details	
	(a) Type	3 phase AC squirrel Cage Induction motor
	(b) Type of Duty	Lift Duty
	(c) Motor Duty	S4
	(d) Duty Cycle of Motor	60%
	(e) Applicable standard	IS:325
	f) No. Of Starts Per Hour	Elevator Motor shall be suitable for minimum of 150 Starts per hour
	g) Direction of rotation	Both Clockwise & Anticlockwise
	h) Class of Insulation	F
	i) Method of Starting	AC Variable Voltage Variable Frequency Drive
36.	Door Motor	
	a) Equipment driven by Motor	Door
	b) Direction of rotation	Both Clockwise & Anticlockwise
	c) Type of enclosures	IP54
37.	Metallic Wire Mesh between Car & Counter Weight	Required
38.	Fire Man Switch	Required
39.	Sound Reducing Material	Isolation Rubber / other arrangement in the Machine shall be provided
40.	Automatic Rescue Device	Provided
41.	Trailing cables	FRLS type
42.	Design seismic coefficient	According to IS 1893 - 1977





TITLE	SPECIFICATION NO. PE – TS - 362 - 502 – A001		
	VOLUME	II	
	SECTION	D	
	REV	0	DATE 14 -11 - 11
	SHEET	OF	


# VOL - II B


## ELECTRICAL


SPECIFICATION :		CUSTOMER :		PROJECT		TITLE		SPECIFICATION :	
NUMBER :		BIDDER/ VENDOR		QUALITY PLAN		NUMBER PED-506-00-Q-007/2		NUMBER :	
SPECIFICATION :		SYSTEM		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		TITLE		SPECIFICATION :	
SHEET 1 OF 9		CAT.		EXTENT OF CHECK		REFERENCE DOCUMENT		SECTION	
CHARACTERISTIC CHECK		TYPE/ METHOD OF CHECK		CHECK		ACCEPTANCE NORM		AGENCY	
P		W		V		P		W	
V		V		V		V		V	
P		W		V		P		W	
V		V		V		V		V	
P		W		V		P		W	
V		V		V		V		V	
P		W		V		P		W	
V		V		V		V		V	
P		W		V		P		W	
V		V		V		V		V	
P		W		V		P		W	
V		V		V		V		V	
P		W		V		P		W	
V		V		V		V		V	
P		W		V		P		W	
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P		W		V		P		W	
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<div></div>		QUALITY PLAN		CUSTOMER :		PROJECT		SPECIFICATION :				
				BIDDER/ VENDOR		TITLE		NUMBER :		SPECIFICATION :		
SHEET 2 OF 9		SYSTEM		QUALITY PLAN		TITLE		VOLUME III				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY	REMARKS		
									P	W	V	
1	2	3	4	5	6	7	8	9	11			
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUF'R'S DRG.	LOG BOOK	3	-	-	
		4. INTERNAL FLOWS	CR	UT	-DO-	ASTM-A388	MANUF'R'S SPEC. BHEL SPEC.	-DO-	3	2	1	FOR DIA OF 55 MM & ABOVE
1.6	SPACE HEATERS, CONNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUF'R'S DRG. SPEC.	MANUF'R'S DRG. SPEC.	-DO-	3	-	-	
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO BREAKAGE ON OTHER PHY. DESIGN	-DO-	3	-	-	
		3. DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUF'R'S DRG./ SPEC.	MANUF'R'S DRG. / SPEC.	-DO-	3	-	-	
		4. PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	-	
BHEL												
BIDDER/VENDOR												
PARTICULARS												
NAME												
SIGNATURE												
DATE												
BIDDER'S/VENDORS COMPANY SEAL												


<div></div>		CUSTOMER :		PROJECT		SPECIFICATION :						
								NUMBER :				
		QUALITY PLAN		TITLE		SPECIFICATION :						
		BIDDER/ VENDOR		QUALITY PLAN		TITLE						
SHEET 3 OF 9		NUMBER PED-506-00-Q-007/2		VOLUME III								
ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		SECTION		REMARKS								
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND.	MA	VISUAL	100%	-	NO VISUAL DEFECTS	INSPT. REPORT	3	-	-	FOR MV MOTOR INSULATION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT
		2. OTHER CHARACTERISTICS	MA	TEST	SAMPLE	MANUF'S SPEC.	MANUF'S SPEC.	LOG BOOK AND OR SUPPLIER'S TC	3	-	2	
		1. SURFACE COND.	MA	VISUAL	100%	-	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK	3	-	-	
1.8	SHEET STAMPING (PUNCHED)	2. DIMENSIONS INCLUDING BURS HEIGHT	MA	MEASUREMENT	SAMPLE	MANUF'S DRG. .	MANUF'S DRG.	-DO-	3	-	2	
		3. ACCEPTANCE TESTS	MA	ELECT. & MECH TESTS	-DO-	MANUF'S SPEC./ RELEVANT IS	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		1. SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	LOG BOOK	3	-	-	
1.9	CONDUCTORS	2. ELECT. PROP. & MECH. PROP	MA	ELECT. & MECH. TEST	SAMPLES	RELEVANT IS/ BS OR OTHER STANDARDS	RELEVANT IS/ BS OR OTHER STANDARDS	SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3/2	-	2	
		BIDDER/VENDOR										
BHEL		PARTICULARS		NAME		SIGNATURE		DATE		BIDDER'S/VENDORS COMPANY SEAL		


		QUALITY PLAN		CUSTOMER :			PROJECT			SPECIFICATION :		
		SHEET 4 OF 9		BIDDER/ VENDOR		TITLE		NUMBER :		SPECIFICATION :		
		COMPONENT/OPERATION		SYSTEM		NUMBER PED-506-00-Q-007/2		TITLE		VOLUME III		
		SL. NO.	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY	REMARKS	
1	2	3	4	5	6	7	8	9	10	11		
1.10	BEARINGS	3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-		
		1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG.	MANFR'S DRG.	-DO-	3	-		
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-		
1.11	SLIP RING	3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-		
		1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-		
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-		
1.12	OIL SEALS & GASKETS	3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC.	MANUF'S SPEC.	-DO-	3	-		
		4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-		
		1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./SPECS.	-DO-	3	-		
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-		
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-		
BHEL		PARTICULARS		BIDDER/VENDOR								
		NAME										
		SIGNATURE										
		DATE										
BIDDER'S/VENDORS COMPANY SEAL												


		CUSTOMER :		PROJECT		SPECIFICATION :	
QUALITY PLAN		BIDDER/ : VENDOR		TITLE		NUMBER :	
SHEET 5 OF 9		SYSTEM CAT.		NUMBER PED-506-00-Q-007/2		TITLE	
COMPONENT/OPERATION		CHARACTERISTIC CHECK		EXTENT OF CHECK		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)	
SL. NO.		3		5		7	
2		4		6		8	
1		9		10		11	
2.0		IN PROCESS					
2.1		STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR )		100%		LOG BOOK	
		1.WORKMANSHIP & CLEANNESS		-DO-		GOOD FINISH	
		2.DIMENSIONS		-DO-		MANUF'S DRG	
		1.FINISH		100%		GOOD FINISH	
2.2		MACHINING		-DO-		MANUF'S DRG	
		2.DIMENSIONS		-DO-		GOOD FINISH	
		3.SHAFT SURFACE FLOWS		-DO-		MANUF'S DRG	
		1.SURFACE PREPARATION		100%		MANUF'S SPEC./ BHEL SPEC./	
2.3		PAINTING		MEASUREMENT BY ELCOMETER		RELEVANT STAND	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)		SAMPLE		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
		3.SHADE		-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
		4.ADHESION		-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				CROSS CUTTING & TAPE TEST		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				MEASUREMENT BY ELCOMETER		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				SAMPLE		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
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				-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				-DO-		BHEL SPEC./BHEL SPEC./ SAME AS COL.7	
				-DO-			

<div></div>		CUSTOMER :		PROJECT		SPECIFICATION :					
QUALITY PLAN		BIDDER/ VENDOR		TITLE		NUMBER :					
SHEET 6 OF 9		SYSTEM		QUALITY PLAN		TITLE					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION	VOLUME III	REMARKS
1	2	3	4	5	6	7	8	9	10	11	
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	3	-	
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	3	-	
		3.CORE LOSS & HOTOPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	3	-	(FOR MOTORS OF 2MW AND ABOVE)
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	3	-	
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	3	-	
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	2	
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	2	1 FOR MV MOTOR
2.6	IMPREGNATION	1.VISCOSITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	3	-	
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	3	-	
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	2 THREE DIPS TO BE GIVEN
BHEL		PARTICULARS		BIDDER/VENDOR							
		NAME									
		SIGNATURE									
		DATE									
											BIDDER'S/VENDORS COMPANY SEAL



<div></div>		CUSTOMER :		PROJECT		SPECIFICATION :											
		TITLE		NUMBER :		SPECIFICATION :											
		QUALITY PLAN		NUMBER PED-506-00-Q-007/2		SECTION											
		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		VOLUME III													
SHEET 7 OF 9		BIDDER/ VENDOR SYSTEM		EXTENT OF CHECK		TYPE/ METHOD OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORM		FORMAT OF RECORD		AGENCY		REMARKS	
SL. NO.	COMPONENT/OPERATION	CAT.	4	5	6	7	8	9	10	11	P	W	V				
1	2	3	4	5	6	7	8	9	10	11							
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION	MA	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	2						
		1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-DO-	-DO-	Log Book	3	-	-						
		1.COMPLETENESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	-						
2.8	BRAZING/COMPRESSION JOINT	2.SOUNDNESS	CR	MALLET TEST & MV TEST	-DO-	-DO-	-DO-	Log Book	3	-	-						
		3.HV	MA	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	3	-	-						
2.9	COMPLETE ROTOR ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	-DO-	MFG SPEC./ ISO 1940	MFG. DWG.	Log Book	3	2	1	VERIFICATION FOR MV MOTOR ONLY					
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	-DO-	MFG. SPEC.	MFG. SPEC.	Log Book	3	2	-						
2.10	ASSEMBLY	1.ALIGNMENT	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	3	-	-						
		2.WORKMANSHIP	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	3	-	-						
		3.AXIAL PLAY	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	3	-	2						
		4.DIMENSIONS	MA	-DO-	-DO-	MFG.DRG./ MFG SPEC.	MFG. DRG/ RELEVANT IS	Log Book	3	-	-						
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	3	-	-						
BHEL		PARTICULARS		BIDDER/VENDOR													
		NAME															
		SIGNATURE															
		DATE															
						BIDDER'S/VENDORS COMPANY SEAL											

<div></div>		QUALITY PLAN		CUSTOMER :		PROJECT		SPECIFICATION :					
		SHEET 8 OF 9		BIDDER/ VENDOR		TITLE		NUMBER :					
				SYSTEM		QUALITY PLAN		SECTION					
				CAT.		REFERENCE DOCUMENT		AGENCY					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	7	8	9	10	VOLUME III REMARKS				
1	2	3	4	5	6	7	8	9	10	11			
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC. 2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC. 3.VIBRATION 4.OVERALL DIMENSIONS AND ORIENTATION 5.DEGREE OF PROTECTION 6.NAMEPLATE DETAILS 7.EXPLOSION FLAME PROOF NESS (IF SPECIFIED) 8.PAINT SHADE, THICKNESS & FINISH	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	3	1	1,2	NOTE - 1	
			MA	-DO-	100%	-DO-	-DO-	-DO-	-DO-	3	1,2	1,2	NOTE - 2
			MA	-DO-	100%	IS-12075	IS-12075	APPROVED DRG/DATA SHEET & RELEVANT IS	-DO-	3	1,2	-	
			MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	INSPC. REPORT		3	2,1	-		
			MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	3	-	2,1	TC FROM AN INDEPENDENT LABORATORY NOTE-3	
			MA	VISUAL	100%	IS-325 & DATA SHEET	INSPC. REPORT		3	2,1	-		
			MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	TC	3	-	2,1	NOTE-3		
			MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	TC	3	2,1	-	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY		
BHEL		PARTICULARS		BIDDER/VENDOR									
		NAME											
		SIGNATURE											
		DATE											

		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :				
		BIDDER/ VENDOR		QUALITY PLAN		SPECIFICATION : TITLE				
SHEET 9 OF 9		SYSTEM CAT.		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		NUMBER PED-506-00-Q-007/2				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD			
								SECTION	AGENCY	VOLUME III
1	2	3	4	5	6	7	8			


  


NOTES:

- 1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED.
- 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON.
- 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED.
- 4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION WITH THE CUSTOMERS, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.

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

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE		SPECIFICATION :			
								NUMBER :		SPECIFICATION TITLE	
SHEET 1 OF 2		BIDDER/ : VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-006/0		ITEM AC ELECT. MOTORS BELOW 75KW (LV)		SECTION AGENCY		VOLUME III REMARKS	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	SYSTEM CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	P	W	V
1	2	3	4	5	6	7	8	9	10		
1.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUF'R'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	3	-	-
2.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	3	-	-
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	3	-	-
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	3	-	-
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	3	2,1	2,1 NOTE-1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-
BHEL		PARTICULARS		BIDDER/VENDOR							
		NAME									
		SIGNATURE									
		DATE									
				BIDDER'S/VENDORS COMPANY SEAL							

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :		
		SHEET 2 OF 2		BIDDER/ VENDOR :		QUALITY PLAN		SPECIFICATION : TITLE :		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	SYSTEM CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY P W V	VOLUME III REMARKS
1	2	3	4	5	6	7	8	9	10	11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	3 1 -	
NOTES: 1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON 2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. 3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.										
BHEL		PARTICULARS		BIDDER/VENDOR						
		NAME								
		SIGNATURE								
		DATE				BIDDER'S/VENDORS COMPANY SEAL				



**TECHNICAL SPECIFICATION FOR  
ELEVATORS  
(ELECTRICAL PORTION)**

SPECIFICATION NO. PE-TS-362-174-A001  
VOLUME II B  
SECTION-C  
REV 01      DATE 24.07.08  
PAGE 1 OF 1

**SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL**

**1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER/ PURCHASER**

- 1.1 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure-I to Section – C [Scope of Work (Electrical)].
- 1.2 Make of various equipment/ items in the scope of bidder shall be to approval of owner during detailed engineering stage without any commercial implications.
- 1.3 Bidder shall furnish all AC as well as DC loads required for the system at different voltage levels (eg. 415V AC, 240 V AC, 220 V DC etc.) of all types, such as motor feeders, supply feeders in PEM format along with the offer.
- 1.4 All electrical equipment shall be suitable for the power supplies, fault levels and climatic conditions indicated in project information enclosed with the specification.
- 1.5 All drawings, data sheets, Quality Plan, calculations, test reports, test certificates, etc. shall be submitted during detailed engineering stage as per formats enclosed. The same shall be subject to approval without any commercial implications.
- 1.6 Technical requirements shall be as per specifications listed in Clause 4.1, 4.2, 4.3 & 4.4 below.

**3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

- 3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:
  - a) A copy of this sheet "Electrical Equipment Specification for ELEVATORS" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
  - b) List of Erection and Commissioning spares.
  - c) List of Erection & Maintenance tools & tackles.
  - d) Electrical load requirement in the load data format.
- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

**4.0 LIST OF ENCLOSURES**

- 4.1 Electrical scope between BHEL & vendor (Annexure-I).
- 4.2 Technical specification no. PE-SS-999-506-E101, Data Sheet (C) for 415V Electric Motors.
- 4.3 Technical specification for Motors, LT switchgear, Power cables, Cabling, Earthing & Lightning Protection.
- 4.4 Quality Plan for motors.
- 4.5 Load data format (Annexure-II).

# ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (ANNEXURE-I)

PACKAGE: ELEVATORS (MAUX)

REV: 0 DATE: 11/11/2011

PROJECT: 2X800 MW YERAMARUS TPS

<u>S. NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&amp;C</u>	<u>REMARKS</u>
1	415V Local Starter Panel	Vendor	Vendor	BHEL will provide two/one number 415 V supply feeders up to DSL for cranes / hoist and 415 V & 240 V in Machine Room for elevators.
2	Power cables, control cables, screened control cables and any special cables (if required) between equipment supplied by vendor.	Vendor	Vendor	
3	Cabling material (cable trays, accessories, cable tray supporting system, conduits etc).	Vendor	Vendor	
4	Equipment Earthing	Vendor	Vendor	All equipments metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL / customer.
5	Motors	Vendor	Vendor	
6	Cable glands and lugs for equipment supplied by vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type tinned copper heavy duty lugs for power cables. 3 solderless crimping type heavy duty copper lugs for control cables.
7	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for C & I systems for vendor supplied equipment shall be furnished during detail engineering by vendor in soft copies in the BHEL cable schedule format.
8	Equipment layout drawings	Vendor	-	
9	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.


NOTE :- 1. Above is applicable if motor starters are part of starter cum control panel & control is relay based.

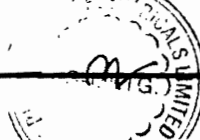
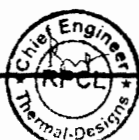
2. If motor starters are provided in main MCC then customer will provide power & control cable including supply, laying & termination.


**SPECIFIC ELECTRICAL REQUIREMENT FOR ELEVATORS**

SL.NO.	PARAMETERS	UNIT	YERAMARUS						
	<b>MOTOR</b>								
1	DESIGN AMBIENT TEMP	DEG. C	50						
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, + 10%						
3	FREQUENCY WITH VARIATION	Hz	50, ± 5%						
4	COMBINED VOLTAGE & FREQUENCY VARIATION		±10%						
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	174 KW						
6	SYSTEM FAULT LEVEL AND ITS DUARTION	KA	50 KA, 1 Sec						
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.2 sec						
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F with Temp. rise limited to class-B.						
9	MIN. STARTING VOLTAGE		80%						
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		0.2 kW & Below						
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	600% ± 15 tolerance						
12	ACCEPTABLE NOISE LEVEL	DB	85dB. Vibration limited as per IS:12075						
13	TYPE OF STARTER PROVIDED IN MCC		DOL						
14	DOP OF ENCLOSURE		IP- 54 for indoor & IP-55 for outdoor.						
15	SPACE HEATER REQUIREMENT	<30kW	30KW & ABOVE						
16	PAINT SHADE		During detail engineering.						
17	SPECIAL REQUIREMENT		TYPE TEST REPORTS MORE THAN 5 YEARS OLD ARE NOT ACCEPTABLE						




	<p align="center"><b>RAICHUR POWER CORPORATION LIMITED</b></p> <p align="center"><b>YERAMARUS TPS - 2x800 MW</b></p> <p align="center"><b>MOTORS</b></p>	<p>SECTION: D2.23</p> <p>VOLUME-IV</p> <p>Page 1 of 5</p>
<p><b>1.0 A.C. MOTORS</b></p>	<p><b>1.1</b> All HT motors shall be suitable for 11kV / 3.3kV, 3 phase, 50 Hz and LV motors shall be suitable for 415V, 3 Phase, 50 Hz power supply.</p> <p><b>1.2</b> The motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment, whichever is higher. Motors shall be capable of starting and accelerating the load with the applicable method of starting without exceeding acceptable winding temperatures when supply voltage is 80% of the rated voltage for motors. Mill motors with higher starting torque requirement shall start with minimum 85 % of rated voltage.</p> <p><b>1.3</b> Motors shall be capable of developing the rated full load torque even if the supply voltage drops to 70% of the rated voltage. If such operation is envisaged for a period of one second, the pull out torque of the motor shall be atleast 205% of full load torque.</p> <p><b>1.4</b> Motors shall withstand for 1 second the voltage and torque stresses developed due to the vector difference between the motor residual voltage and the incoming supply voltage equal to 150% of the rated voltage during fast change over of buses.</p> <p><b>1.5</b> Starting current of all HT motors shall be 600 % inclusive of IS tolerance except for BFP motor and mill motor.</p> <p>For BFP motor starting current shall be 500 % inclusive of IS tolerance.</p> <p>For mill motor starting current shall be 600 % subject to IS tolerance.</p> <p><b>1.6</b> The locked rotor withstand time under hot condition at 110% rated voltage shall be more than the starting time at minimum permissible voltage specified above by atleast three seconds or 15% of the accelerating time whichever is greater. Provision of speed switch shall be avoided to the extent possible.</p> <p><b>1.7</b> The degree of protection for the motor enclosure shall be IP-55 and IP-54 for outdoor &amp; indoor respectively and terminal boxes shall be provided with atleast IP-55. For single core cable termination, gland plates shall be of non-magnetic material. All motors located in hazardous area shall have flame proof design.</p> <p><b>1.8</b> All HT motors shall be provided with vibration pads for mounting vibration detectors.</p> <p><b>1.9</b> Motors rated 1000 kW and above shall be provided with differential protection. These motors shall be provided with star connected stator windings. The 3 nos. current transformers, one for each phase shall be mounted in a separate compartment in the neutral side terminal box. The three phases shall be connected to form the star point after they pass through the CTs. The CTs shall be of relay accuracy and the CT characteristics shall be compatible with the differential relay. The additional 3 nos. CTs of identical characteristics shall be provided in the 11kV / 3.3 kV switchgear panel. kWh measurement shall be provided on all HT motor feeders.</p> <p><b>1.10</b> Wherever provided, Motor can run without FOLS during coasting down to rest only.</p> <p><b>1.11</b> For 11kV &amp; 3.3kV motors, 6 nos. duplex/ 12 nos. simplex RTDs for winding shall be provided. Each bearing shall be provided with one no.PT-100 duplex type RTDs for temperature monitoring. These Motor are suitable for maximum 2 % harmonic.</p>	



	<p align="center"><b>RAICHUR POWER CORPORATION LIMITED</b></p> <p align="center"><b>VERAMARUS TPS - 2x800 MW</b></p> <p align="center"><b>MOTORS</b></p>	<p>SECTION: D2.23</p> <p>VOLUME-IV</p> <p>Page 2 of 5</p>
	<p>1.12 The maximum double amplitude vibrations for motors shall be as per IS:12075 .</p> <p>1.13 Maximum noise level measured at a distance of 1 metre from the outer surface of the motor shall not exceed 85 dB (A).</p> <p>1.14 Cable boxes of all 11kV &amp; 3.3kV motors shall be provided with quick disconnecting type terminal connectors to facilitate easy disconnection and removal of the motors without requiring unsealing or otherwise disturbing the external cable connections and leaving the phase segregated terminal box intact.</p> <p>1.15 The insulation system for 11000V &amp; 3300 V AC motors shall withstand the negative or positive 0.3 / 3.0 microsecond wave (2.7 pu rated peak line to earth operating voltage) switching surges originating from non-effectively earthed power system. All 11000V &amp; 3300 V AC motors shall have BIL and withstand frequency voltage as per relevant standards.</p> <p><b>2.0 DC MOTORS</b></p> <p>2.1 DC motors shall be suitable for the DC system voltage available in the plant. Motor shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range of 85% to 110% of rated motor voltage. The field windings for the motors shall be continuously rated without forced ventilation.</p> <p><b>3.0 ACTUATOR MOTORS</b></p> <p>3.1 The actuator motors shall be designed for short time duty (S2) in accordance with IEC 60034-1.</p> <p>3.2 Hand wheel operation shall be provided in addition to motor drive.</p> <p>3.3 The DC and AC actuator shall be provided with accessories viz., Torque limit switch, end of travel switch, adjustable limit switch, hand wheel motor, thermostat, integral starter, valve position indicator, Manual-Auto lever with suitable locking arrangement, etc. Complete actuator shall be tested at factory as per IS 9334.</p> <p>3.4 Two normally open and two normally closed or two changeover potential free contacts corresponding to open and close positions of the valve shall be provided.</p> <p>3.5 Degree of protection for actuator motor enclosure shall be IP-55 and IP-67 for indoor and outdoor respectively.</p> <p><b>4.0 TESTS</b></p> <p>4.1 Tests on all types of motors shall be conducted as per relevant standard.</p> <p>4.2 All type, routine &amp; acceptance tests as per relevant IS shall be conducted on 11 kV &amp; 3.3 kV motors. For LT motors, type test certificates for tests carried out earlier for each rating and frame size &amp; make shall be furnished, and for all motors routine and acceptance tests shall be conducted as per relevant standards.</p> <p>4.3 For 11000V and 3300V AC motors, in addition to all the tests specified above,</p>	



 <b>RAICHUR POWER CORPORATION LIMITED</b> <b>YERAMARUS TPS - 2x800 MW</b>	<b>SECTION: D2.23</b> <b>VOLUME-IV</b> <b>Page 3 of 5</b>	
	<b>MOTORS</b>	

polarisation index test shall be carried out as a routine test on each motor (the minimum value of polarisation index for all motors shall be 2 when determined according to IS : 7816).

4.4 Noise level measurements shall be done on motor as a type test on each type and rating. Vibration measurement shall be done on all motors as a routine test.

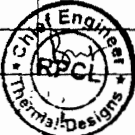
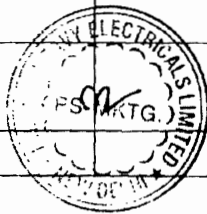
4.5 Di-electric tests. Existing report of impulse test as per IEC 60034 15 shall be furnished.


4.6 All characteristic curves for the motors above 55kW (and lower rating critical drives identified during detailed engineering) including hot and cold withstand characteristics, starting time vs current, current vs speed, speed vs torque at 110%, 100% and 90% of rated voltage, negative withstand characteristics, rotor voltage vs rotor current curves (for wound motors), Efficiency, power factor, slip, current Vs output curve etc., shall be furnished.

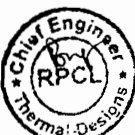
5.0 **TECHNICAL REQUIREMENTS**

The motors shall comply with the particulars indicated below and CONTRACTOR shall furnish the details in respective column given below (to be separately submitted for different type & rating of the motor).

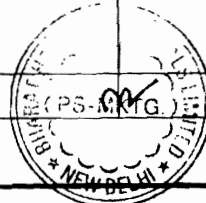
SL. NO.	DESCRIPTION	UNIT	SPECIFICATION REQUIREMENT	CONTRACTOR
I	AC Motors			
1.0	Application/Designation		*	
2.0	Manufacturer		*	
3.0	Type of motors/ frame size		Squirrel cage except for cranes	
4.0	Rated			
	(a) Output	kW	*	
	(b) Speed	rpm	*	
	(c) Voltage	V	*	
	(d) No.of Phases / Frequency		*	
	(e) System neutral		*	
5.0				
5.1	Type of Duty (IS-325 or equivalent)		*	
5.2	Duty designation (IS-325 or equivalent)		*	
6.0	Supply Conditions			





 <b>RAICHUR POWER CORPORATION LIMITED</b> <b>YERAMARUS TPS - 2x800 MW</b>		<b>SECTION: D2.23</b> <b>VOLUME-IV</b> <b>Page 4 of 5</b>	
<b>MOTORS</b>			
	(a) Allowable variations in		
	(i) Voltage	%	± 10
	(ii) Frequency	%	± 5
	(iii) Combined	%	10(sum of absolute values)
	(b) Permissible unbalance in supply voltage	%	2
7.0	Current		*
	(a) Full load	Amps	*
	(b) Starting	% FL	*
8.0	Method of starting		DOL
8.1	Starting time	Sec	*
	With rated Voltage		
	With min. Voltage		
	With Max. Voltage		
8.2	Safe stall time under hot/cold condition	Sec	*
	With rated Voltage		
	With min. Voltage		
	With Max. Voltage		
9.0	Insulation		
9.1	Class of insulation		Class F with temperature rise limited to Class B
9.2	Temperature rise by winding resistance method	Deg. C	temp. rise limited to Class B
10.0	Type of cooling (IS : 6362)	Deg. C	TEFC for LV, TEFC / TETV/CACA/CAC W for 11/3.3 KV motors.
11.0	Degree of protection (IS:4691 or equivalent)		Refer Clause 1.7
12.0	Suitable for outdoor operation	Yes / No	*
13.0	Normal winding connection	Star / Delta	*
14.0	Permissible No. of equally spread starts per hour under normal service conditions		*
15.0	Efficiency (%)	%	*



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	<b>RAICHUR POWER CORPORATION LIMITED</b> <b>YERAMARUS TPS - 2x800 MW</b>		SECTION: D2.23 VOLUME-IV Page 5 of 5
	<b>MOTORS</b>		


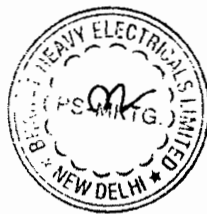
  

	Full load		
	75 % Load		
	50 % Load		
	25 % Load		
16.0	Power Factor		*
	Full Load		
	75 % Load		
	50 % Load		
	25 % Load		
17.0	Torque		*
	Starting		
	Maximum (Pullout)		
	Pull up		
18.0	Motor reactance (pu)		*
	Subtransient		
	Transient		
	Steady state		
15.0	Fault level	kA/sec	*
II	<b>DC MOTORS</b>		
16.0	Rated Voltage	V	220 V DC
17.0	Class of Insulation	:	Class F with temperature rise limited to class B
18.0	Temperature rise	:	Class F with temperature rise limited to class B
19.0	Method of starting	:	*


Items under AC motors which are applicable for DC motors shall also be listed

NOTE :

“\*” Information shall be furnished by contractor during detailed engineering.

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	TITLE : <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : <b>II-B</b>
		SECTION : <b>D</b>
		REV NO. : <b>00</b> DATE : 29/08/2005
		SHEET : 1 OF 1

## **GENERAL TECHNICAL REQUIREMENTS**

**FOR**

**LV MOTORS**

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

	<b>TITLE :</b> <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : <b>II-B</b>
		SECTION : <b>D</b>
		REV NO. : <b>00</b> DATE : 29/08/2005
		SHEET : 1 OF 4

### 1.0 INTENT OF SPECIFICATION

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

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

### 2.0 CODES AND STANDARDS

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

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

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

### 3.0 DESIGN REQUIREMENTS


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

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


#### 3.3 Starting Requirements


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

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

	<b>TITLE :</b> <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	<b>SPECIFICATION NO.</b> PE-SS-999-506-E101 <b>VOLUME NO. :</b> II-B <b>SECTION :</b> D <b>REV NO. : 00</b> DATE : 29/08/2005 <b>SHEET : 2 OF 4</b>
	<p>The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.</p> <p>3.3.3 The following frequency of starts shall apply</p> <ul style="list-style-type: none"> <li>i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.</li> <li>ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)</li> <li>iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor</li> </ul> <p>3.4 <b>Running Requirements</b></p> <p>3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.</p> <p>3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.</p> <p>3.5 <b>Stress During bus Transfer</b></p> <p>3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.</p> <p>3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.</p> <p>3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.</p> <p>3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.</p> <p>4.0 <b>CONSTRUCTIONAL FEATURES</b></p> <p>4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy</p> <p>4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.</p> <p>Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled</p> <p>4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.</p>	



	TITLE : <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : <b>II-B</b>
		SECTION : <b>D</b>
		REV NO. : <b>00</b> DATE : 29/08/2005
		SHEET : 3 OF 4
4.4.	Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.	
4.5	Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.	
4.6	In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.	
4.7	<b>Terminals and Terminal Boxes</b>	
4.7.1	Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.  Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".	
4.7.2	unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.	
4.7.3	Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.	
4.7.4	Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.	
4.7.5	Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating-the cable specified in Data Sheet-A.	
4.7.6	Degree of protection for terminal boxes shall be IP 55 as per IS 4691.	
4.7.7	Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.	
4.7.8.	Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.	
4.7.9	Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.	
4.8	Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.	
4.9	<b>General</b>	

	<b>TITLE :</b> <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	<b>SPECIFICATION NO.</b> PE-SS-999-506-E101 <b>VOLUME NO. :</b> II-B <b>SECTION :</b> D <b>REV NO. : 00 DATE :</b> 29/08/2005 <b>SHEET : 4 OF 4</b>
	<p>4.9.1 Motors provided for similar drives shall be interchangeable.</p> <p>4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.</p> <p>4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.</p> <p>4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.</p> <p>4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.</p> <p>4.9.6 Name plate with all particulars as per IS: 325 shall be provided</p> <p>4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.</p> <p><b>5.0 INSPECTION AND TESTING</b></p> <p>5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.</p> <p>5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.</p> <p>5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.</p> <p>5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.</p> <p><b>6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT</b></p> <p>a) OGA drawing showing the position of terminal boxes, earthing connections etc.</p> <p>b) Arrangement drawing of terminal boxes.</p> <p>c) Characteristic curves:  <i>(To be given for motor above 55 kW unless otherwise specified in Data Sheet).</i></p> <p>i) Current vs. time at rated voltage and minimum starting voltage.</p> <p>ii) Speed vs. time at rated voltage and minimum starting voltage.</p> <p>iii) Torque vs. speed at rated voltage and minimum voltage.          For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.</p> <p>iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.</p>	

TITLE

SPECIFICATION NO. PE – TS - 362 - 502 – A001



**TECHNICAL SPECIFICATION  
FOR  
ELEVATOR**

VOLUME III

SECTION D

REV 0 DATE 14 - 11- 11

SHEET OF

# SECTION – III SCHEDULES

TITLE

SPECIFICATION NO. PE – TS - 362 - 502– A001



**TECHNICAL SPECIFICATION  
FOR  
ELEVATOR**

VOLUME III

SECTION D

REV 0 DATE 14 - 11 - 11

SHEET OF


**VOL - III**

**TECHNICAL SCHEDULES / DATA SHEET – B/C**

## ANNEXURE - II


ANNEXURE - II			
	<b>SPECIFIC CONFIRMATION / COMMENTS REQUIRED FROM BIDDER</b>	SPECIFICATION: PE-TS-362-502-A001	
	<b>TITLE: Passenger Elevator</b>	VOLUME-II B	SECTION-C REVISION:0
	<b>PROJECT: 2 x 800 MW YERAMARUS STPP.</b>	DATE: 14-11- 2011	No. of SHEETS: 2
		REPLY / COMMENTS BY BIDDER	
S.N.	DESCRIPTION		
1.00	MECHANICAL		
1.01	Bidder to confirm compliance to the Data sheet -A attached along with Technical Specification No.PE-TS-362-502-A001 without any deviation.	CONFIRMED / NOT CONFIRMED	
1.02	In case of any deviation, the same shall be furnished in the Deviation schedule attached along with the Technical Specification. Bidder to note that deviation mentioned elsewhere will not be taken cognizance of in any case. <b>Bidder to confirm the same.</b>	CONFIRMED / NOT CONFIRMED	
1.03	Bidder to confirm that there is no deviation from the min requirement of QAP attached along with the Technical Specification.	CONFIRMED / NOT CONFIRMED	
1.04	The material offered is equal or better in grade than specified in technical specification. <b>Bidder shall confirm the compliance.</b>	CONFIRMED / NOT CONFIRMED	
1.05	Bidder to confirm that in case of award of order, GA drawing, Data sheet, Quality plan and sizing calculation of motor shall be submitted to BHEL within one week of receiving the LOI. <b>Bidder to confirm</b>	CONFIRMED / NOT CONFIRMED	
1.06	<b>Bidder to confirm that the following drawings and documents has been submitted by them as a part of technical bid :-</b> 1) Electrical load list for each elevator 2) Deviation schedule (if any) 3) GA of elevator with Pit, shaft, M/c room details and motor power calculation for all types and capacities of elevator 4) Signed and stamped copy of Electrical scope matrix and electrical specification 5) Signed and stamped copy of Specific confirmation sheet (Annexure – II). 6) Capacity of air conditioner for machine room and hoist	CONFIRMED / NOT CONFIRMED	

2.00	<b>ELECTRICALS</b>		
2.01	<b>CABLES</b>		
a	All CONTROL AND POWER cables shall be as per BHEL specification. <b>Bidder shall confirm the compliance</b>	CONFIRMED / NOT CONFIRMED	
b	Makes of cables shall be as agreed in between BHEL / Customer during contract stage and approved make shall only be supplied. <b>Bidder shall confirm the compliance</b>	CONFIRMED / NOT CONFIRMED	
2.02	<b>MOTORS</b>		
a	Class of insulation of Sq. cage motors shall be "F" and the temperature rise to limited to class "B". <b>Bidder shall confirm the compliance</b>	CONFIRMED / NOT CONFIRMED	
b	Motor size shall be subjected to the approval of motor calculation. <b>Bidder shall confirm the compliance</b>	CONFIRMED / NOT CONFIRMED	
c	The successful bidder shall submit the data sheet of LV motors and power & control cables during detailed engineering and the same is subjected to customer approval without any cost implication on account of the same. <b>Bidder shall confirm the compliance</b>	CONFIRMED / NOT CONFIRMED	
d	The QPs related to electrical items shall be approved during detailed engineering. However, the minimum requirements indicated in the QP's attached with NIT specification shall be complied. <b>Bidder shall confirm the compliance.</b>	CONFIRMED / NOT CONFIRMED	
e	Bidder to confirm that there is no technical deviation from NIT specification for elevator.	CONFIRMED / NOT CONFIRMED	

	<b>TITLE</b>  <b>MOTOR</b>  <b>DATA SHEET - C</b>	<b>SPECIFICATION NO.</b>
		<b>VOLUME II B</b>
		<b>SECTION D</b>
		<b>REV NO. 00 DATE 29/08/2005</b>
		<b>SHEET 1 OF 2</b>

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			


	<b>TITLE</b>  <b>MOTOR</b>  <b>DATA SHEET - C</b>	<b>SPECIFICATION NO.</b>
		<b>VOLUME</b> II B
		<b>SECTION</b> D
		<b>REV NO. 00</b> <b>DATE 29/08/2005</b>
		<b>SHEET</b> 2 <b>OF</b> 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			






	<b>TITLE</b> <b>SCHEDULE OF DEVIATION</b>		<b>SPECIFICATION NO.:</b> PE-TS-362-502-A001	
			<b>VOLUME III</b> <b>PART A</b>	
			<b>SHEET</b> <b>OF</b>	
<p>           ( ) From general terms and conditions of contract and special condition of contract (Vol. I)            ( ) From technical specifications (Vol. II B)            ( ) From general terms and conditions of contract for erection (vol. I)            ( ) From general technical conditions (Vol. IIC)  <b>Note:</b> Each type of deviation shall be listed on a separate sheet.            -         </p>				
We the undersigned hereby certify that the above-mentioned information's are the ONLY deviations				
NAME		DESIGNATION	SIGN      DATE	COMPANY SEAL





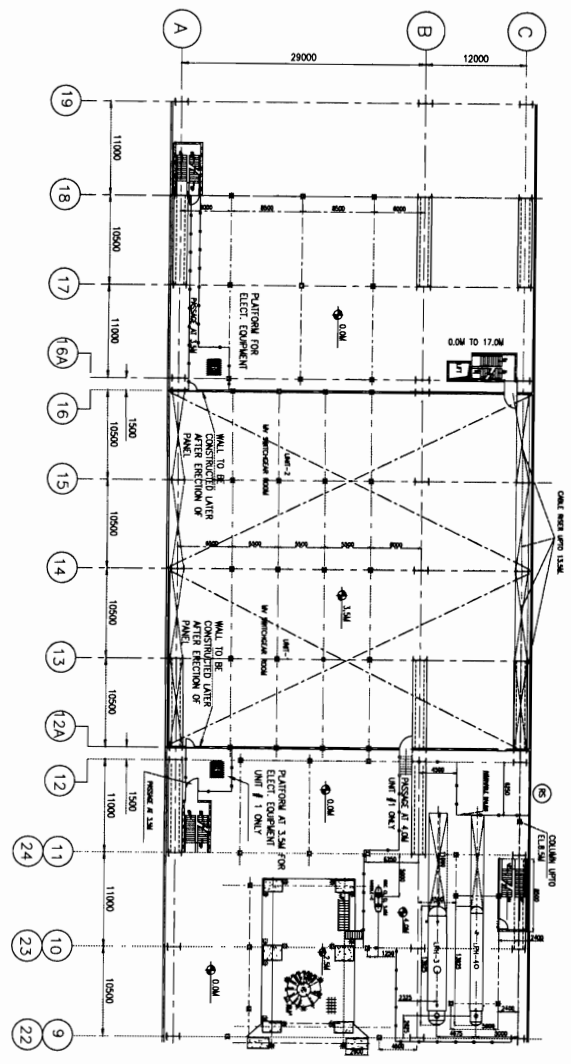


	TITLE  TECHNICAL SPECIFICATION  FOR  ELEVATOR	SPECIFICATION NO. PE – TS -362 - 502 – A001	
		VOLUME III	
		SECTION	
		REV 0	DATE 14 - 11 - 11
		SHEET OF	

**Checklist for bidders of Elevator**

<b><u>Sl. no.</u></b>	<b><u>Item Description</u></b>	<b><u>Bidder's reply</u></b>
01)	Brief technical parameters of the machine, list of standard accessories, list of special accessories as per the specification, weight of heaviest part of the component and total weight of machine in tones furnished?	Yes / No
02)	Catalogue of each item / machine furnished?	Yes / No
03)	Filled up sketch showing dimensions and maintenance space required for each of offered machine furnished?	Yes / No
04)	Filled up electrical load data format indicating no. of motors, their name plate rating, guaranteed power consumption, type of feeder required etc. as per BHEL's format furnished?	Yes / No
05)	List of recommended spares for three (3) years of operation in terms of numbers indicating sizes / rating furnished?	Yes / No
06)	Commissioning spares in terms of numbers indicating sizes / ratings furnished and included in bidder's scope?	Yes / No
07)	No deviation certificate furnished?	Yes / No

**NOTE : BIDDER SHALL SUBMIT THE ABOVE DATA ALONG WITH THE TECHNICAL OFFER. IN THE ABSENCE OF ANY OF THE ABOVE DATA, BID SHALL BE LIABLE TO BE REJECTED. BIDDERS SHALL ENSURE THAT ALL THESE DATA ARE AVAILABLE IN THEIR TECHNICAL BID.**

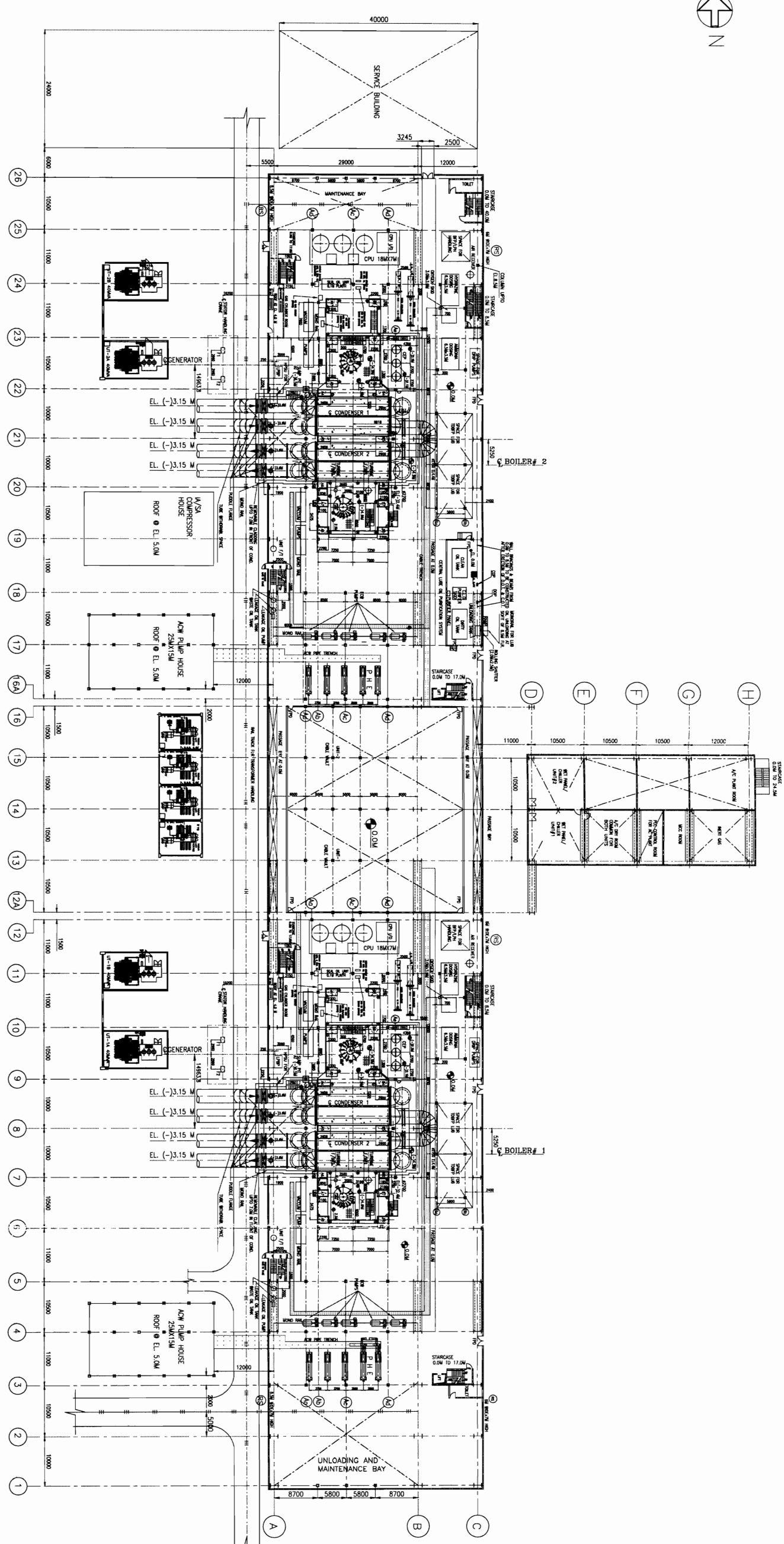


REFERENCE DRUGS:

REFERENCE DRGS.				
SL.NO	TITLE	NUMBER	REVISION	UNIT
1	TO EQUIPMENT PLANT AT ELL 3.54	PF-DO-362-200-4004	02	PSM
2	TO EQUIPMENT PLANT AT ELL 7.04	PF-DO-362-200-4005	02	PSM
3	TO EQUIPMENT PLANT AT MISCELLANEOUS FLOORS IN BC BAY	PF-DO-362-200-4006	02	PSM
4	TO VAIL CROSS SECTION	PF-DO-362-200-4007	02	PSM
5	CONDENSER ASSEMBLY (GENERAL ARRANGEMENT)	01601100632 0177	00	HND
6	GENERAL ARRANGEMENT OF DRAIN COOLER # 1	2-16-01-200231	00	HND
7	GENERAL ARRANGEMENT OF DRAIN COOLER # 2	2-16-01-20032	00	HND
8	GENERAL ARRANGEMENT OF DRAIN COOLER # 3	0160307004C177	00	HND
9	GENERAL ARRANGEMENT OF LNH # 3	2-162-36-00169	00	HND
10	GENERAL ARRANGEMENT OF LNH # 4	2-162-36-00190	00	HND
11	GENERAL ARRANGEMENT DED P / I /	HOLD	-	BRL
12	GENERAL ARRANGEMENT HED P / I /	HOLD	-	BRL
13	GENERAL ARRANGEMENT CEP	1H-DO-1-61800-0786	00	HND
14	GENERAL ARRANGEMENT SEAL OIL UNIT	PENDING	AWAITED	HND
15	GENERAL ARRANGEMENT OF VACUUM PUMPS	PENDING	AWAITED	HND
16	GENERAL ARRANGEMENT OF GAS CILINDERS ROOM	PENDING	AWAITED	HND
17	TOEP LINE OIL	2-31620-021096	00	HND
18	WATER FOR LUPP	HOLD	-	PSM
19	DOP PUMPS	2-31620-021146	00	HND
20	GAS WASTE OIL TANK	PENDING	-	PSM
21	GAS OF FINE	PENDING	-	PSM
22	LEAKAGE OIL TANK AND PUMP	2-31620-021145	00	HND

1. ALL DIMENSION WAYS AND LEVELS ARE IN METRES.
2. ALL ELEVATION MARKED ARE W.R.T. TO HALL GROUND FLOOR ELEVATION OF 0.0M WHICH CORRESPONDS TO RL 362.0M.
3. ALL THE SEGS AND LOCATION OF COLUMNS OF TC BECK ARE SUBJECT TO FINALIZATION AFTER CIVIL DESIGN.
4. SEGS OF ALL TG BUILDING HALL AND AUXILIARY COLUMNS AND CONTROL TOWER COLUMNS ARE SUBJECT TO CIVIL DESIGN.
5. DIMENSIONS OF AUXILIARY BUILDINGS SHOWN IN THIS DRAWING ARE TENTATIVE. ACTUAL DIMENSION WILL BE FURNISHED DURING DESIGN ENGINEERING STAGE.
6. SIZE OF DOOR/FRONT/STAIR LAND IS SHOWN FOR REFERENCE PURPOSE ONLY FOR DETAILS REFER ELECTRICAL DRAWING.
7. SEGS OF TIE-BEAMS & STAYS ARE INDICATING AND THESE WILL BE FINALIZED DURING CIVIL DETAILING.
8. FOR LOCATION OF TRANSFORMERS REFER PE-06-362-100-001.

[illegible]



PLAN AT EL. 3.5/4.0M

SL NO	TITLE	NUMBER	REVISION	UNIT
1	TO EQUIPMENT PLAN AT EL. 0.0 M	PE-DG-362-100-M003	02	PEM
2	TO EQUIPMENT PLAN AT EL. 3.5 M	PE-DG-362-100-M003	02	PEM
3	TO EQUIPMENT PLAN AT EL. 4.0 M	PE-DG-362-100-M003	02	PEM
4	TO EQUIPMENT PLAN AT EL. 5.0 M	PE-DG-362-100-M003	02	PEM
5	TO EQUIPMENT PLAN AT EL. 6.0 M	PE-DG-362-100-M003	02	PEM
6	TO EQUIPMENT PLAN AT EL. 7.0 M	PE-DG-362-100-M003	02	PEM
7	TO EQUIPMENT PLAN AT EL. 8.0 M	PE-DG-362-100-M003	02	PEM
8	TO EQUIPMENT PLAN AT EL. 9.0 M	PE-DG-362-100-M003	02	PEM
9	TO EQUIPMENT PLAN AT EL. 10.0 M	PE-DG-362-100-M003	02	PEM
10	TO EQUIPMENT PLAN AT EL. 11.0 M	PE-DG-362-100-M003	02	PEM
11	TO EQUIPMENT PLAN AT EL. 12.0 M	PE-DG-362-100-M003	02	PEM
12	TO EQUIPMENT PLAN AT EL. 13.0 M	PE-DG-362-100-M003	02	PEM
13	TO EQUIPMENT PLAN AT EL. 14.0 M	PE-DG-362-100-M003	02	PEM
14	TO EQUIPMENT PLAN AT EL. 15.0 M	PE-DG-362-100-M003	02	PEM
15	TO EQUIPMENT PLAN AT EL. 16.0 M	PE-DG-362-100-M003	02	PEM
16	TO EQUIPMENT PLAN AT EL. 17.0 M	PE-DG-362-100-M003	02	PEM
17	TO EQUIPMENT PLAN AT EL. 18.0 M	PE-DG-362-100-M003	02	PEM
18	TO EQUIPMENT PLAN AT EL. 19.0 M	PE-DG-362-100-M003	02	PEM
19	TO EQUIPMENT PLAN AT EL. 20.0 M	PE-DG-362-100-M003	02	PEM
20	TO EQUIPMENT PLAN AT EL. 21.0 M	PE-DG-362-100-M003	02	PEM
21	TO EQUIPMENT PLAN AT EL. 22.0 M	PE-DG-362-100-M003	02	PEM
22	TO EQUIPMENT PLAN AT EL. 23.0 M	PE-DG-362-100-M003	02	PEM
23	TO EQUIPMENT PLAN AT EL. 24.0 M	PE-DG-362-100-M003	02	PEM

NOTES:-

- ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METRES.
- ALL ELEVATIONS MARKED ARE W.R.T. TO HULL GROUND FLOOR ELEVATION OF 0.0M WHICH CORRESPONDS TO RL 362.0M.
- ALL THE SIZES AND LOCATION OF COLUMNS OF TG DECK ARE SUBJECT TO FINALIZATION AFTER CIVIL DESIGN.
- SIZES OF ALL TG BUILDING MAIN AND AUXILIARY COLUMNS AND CONTROL TOWER COLUMNS ARE SUBJECT TO CIVIL DESIGN.
- DIMENSIONS OF AUXILIARY BUILDINGS SHOWN IN THIS DRAWING ARE TENTATIVE. ACTUAL DIMENSION WILL BE FURNISHED DURING DETAIL ENGINEERING STAGE.
- CABLE D/C/FRENCH/SILT LAYOUT IS SHOWN FOR REPRESENTATION PURPOSE ONLY. FOR DETAILS REFER ELECTRICAL DRAWING.
- SIZES OF TOWERS & STARS ARE INDICATIVE AND THESE WILL BE FINALIZED DURING CIVIL DETAILING.
- FOR LOCATION OF TRANSFORMERS REFER PE-DG-362-100-E001.

**LEGEND**

PIPE MATCH  
VERTICAL BREAKING  
PIPE PROOF DOOR  
GROUNDING  
CHARGED PLATE  
REMOVABLE  
HAND RAILING  
PIPE & CABLE TRAY  
FIRE BARRETT WALL  
INDICATE PRESS./OIL TESTILE  
INDICATE SHUTTER  
CABLE TRAY  
CABLE SUT

**STATUS CONTRACT**

**PROJECT** RAICHUR POWER CORPORATION LIMITED  
(A JVC OF KPCL & BHEL)  
EVONIK ENERGY SERVICES (INDIA) LTD  
2X800MW YEARMAHARUS SUPERCRITICAL TPP

**PROJECT'S ENGINEER** BHARAT HEAVY ELECTRICALS LTD  
PROJECT'S SUPERVISOR

**PROJECT'S DESIGNER** BHARAT HEAVY ELECTRICALS LTD  
PROJECT'S CHECKER

**PROJECT'S APPROVER** BHARAT HEAVY ELECTRICALS LTD  
PROJECT'S REVIEWER

**PROJECT'S FINALIZER** BHARAT HEAVY ELECTRICALS LTD  
PROJECT'S SIGNATURE

**PROJECT'S DATE** 10/07/2013  
PROJECT'S SCALE

**PROJECT'S SHEET NO.** 1 OF 1  
PROJECT'S SHEET TOTAL

**PROJECT'S SHEET NO.** 1 OF 1  
PROJECT'S SHEET TOTAL





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15 icons representing various products and services:

- VERTICAL BLINDS
- PET WINDOW
- PERFECT DOOR
- PAINTING
- CHALKBOARD PLATE
- RENOVATION
- INDOOR PLANT
- PERFECT COAT TENSILE
- PERFECT BARRIER WALL
- MODERN PERFECT COAT TENSILE
- ROLLING SHUTTER
- PERFECT
- PERFECT
- PERFECT
- PERFECT

REFERENCE DROGS:				
SL NO	TITLE	NUMBER	REVISION	UNIT
1	T.G. HALL DROSS SECTION	PF-002-363-10040007	02	PFM
2	TIG EQUIPMENT PLAN AT EL. 0.0 M	PF-002-363-10040003	02	PFM
3	TIG EQUIPMENT PLAN AT EL.0.70 M	PF-002-363-10040005	02	PFM
4	TIG EQUIPMENT PLAN AT MISCELLANEOUS FLOORS IN BC BAY	PF-002-363-10040005	02	PFM
5	OIL ROOM ARRANGEMENT	0-131004/02010	01	HMR
6	LP BYPASS VALVE ARRANGEMENT	0-131004/02002	00	HMR
7	OIL CANAL FOUNDATION PLAN	0-131004/02001	00	HMR
8	GA LP HEATER 1A / 2A & 1B /2B	PENDING	-	HVO
9	GA HP HEATER 6A	2-17504/01403	00	HVO
10	GA HP HEATER 6B	2-17504/01404	00	HVO
11	GA HP HEATER 7A	2-17505-05-00087	00	HVO
12	GA HP HEATER 7B	2-17505-05-00086	00	HVO
13	HPSPU FOR TURBINE VALVE	3-131004/21705	00	HMR
14	GA OF MDDSP LUBE SYSTEM	PENDING	-	HVO
15	GA OF OLV	12565-980224	00	HMR/3XAG
16	GA OF HP BP VALVE	PENDING	-	HMR

PLAN AT EL. 7.7/8.5/11.5 M

NOTES:-

1. ALL DIMENSION ARE IN MM AND LEVELS ARE IN METERS.
2. ALL ELEVATION MARKED ARE W.R.T. HALL GROUND FLOOR ELEVATION OF 0.00M WHICH CORRESPONDS TO RL 362.0M.
3. ALL THE SIZES AND LOCATION OF COLUMNS OF TO DECK ARE SUBJECT TO FINALIZATION AFTER CIVIL DESIGN.
4. SIZES OF ALL TO BUILDING MAIN AND AUXILIARY COLUMNS AND CONTROL TOWER COLUMNS ARE SUBJECT TO CIVIL DESIGN.
5. SIZES OF TOILETS & STAIRS ARE INDICATIVE AND THESE WILL BE FINALIZED DURING CIVIL DETAILING.

[illegible]

**RAJCHUR POWER CORPORATION LIMITED**  
(A JVC OF KPCL & BHEL)

**EVONIK ENERGY SERVICES (INDIA) LTD**

**PRODUCT**

**2x800MM VERRAMARUS SUPERCRITICAL TPP**

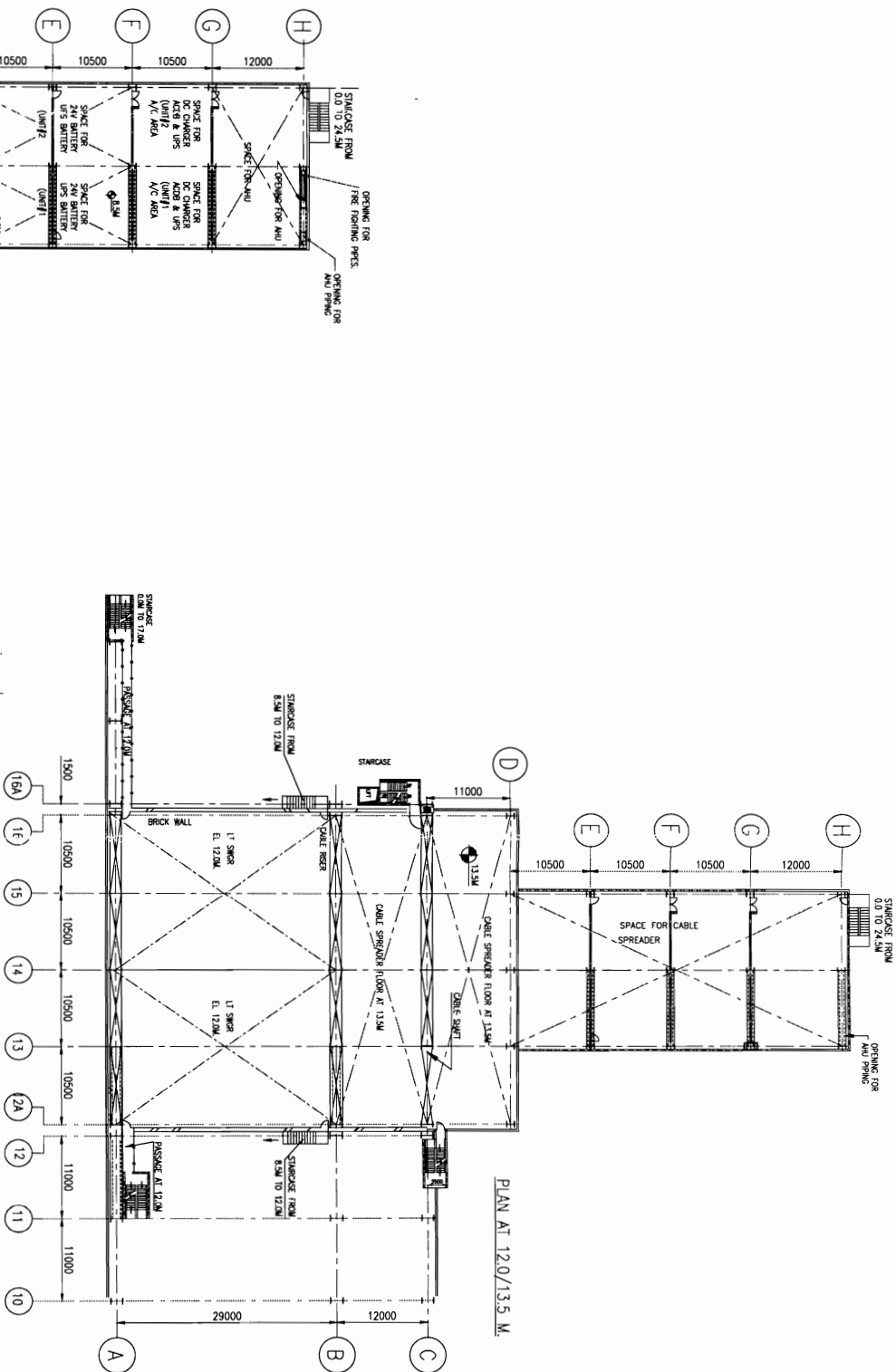
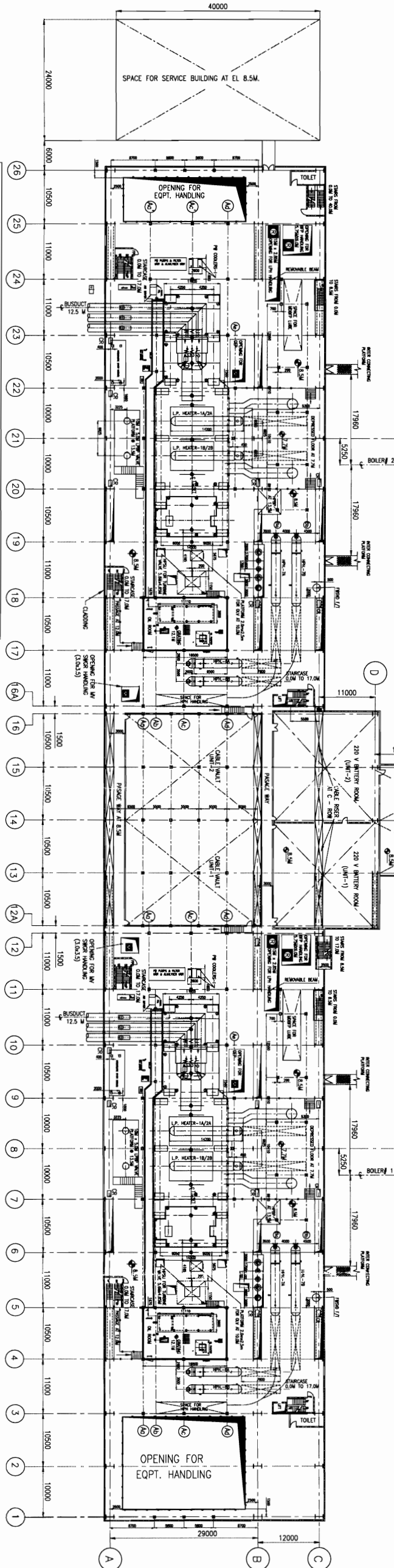
**BHARAT HEAVY ELECTRICITIES LTD**  
**PROJECTS ENGINEERING MANAGEMENT**  
**INDIA**

**UNIT**

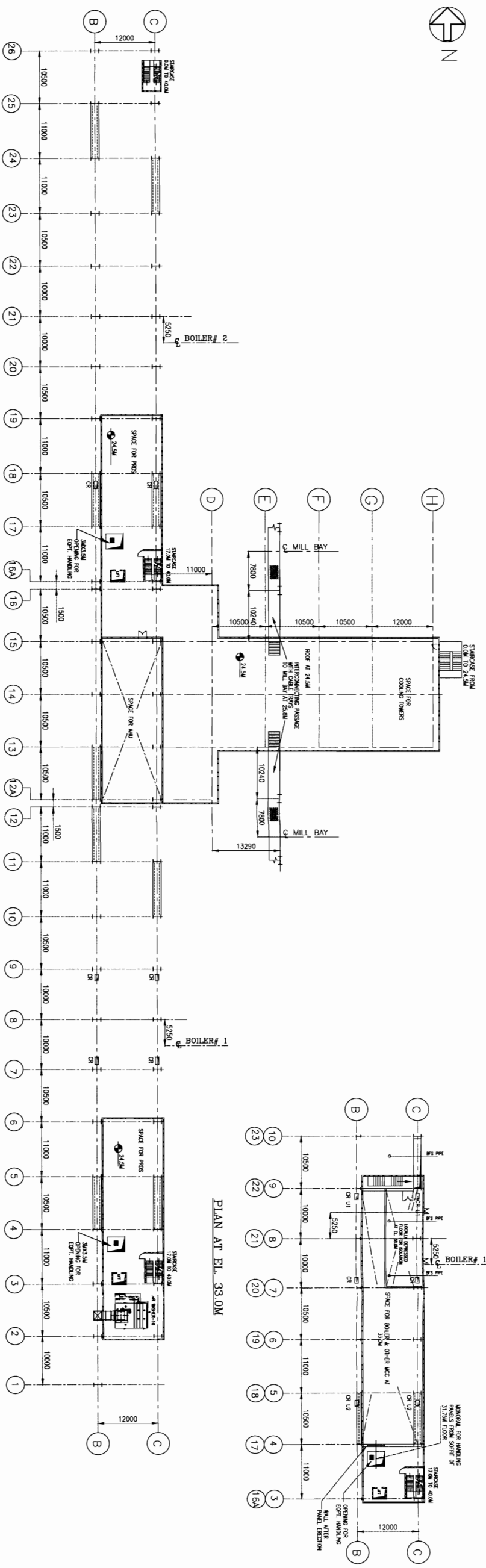
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76	77	78	79	80
81	82	83	84	85
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91	92	93	94	95
96	97	98	99	100

**2G EQUIPMENT PLANT AT EL 6.5 M**

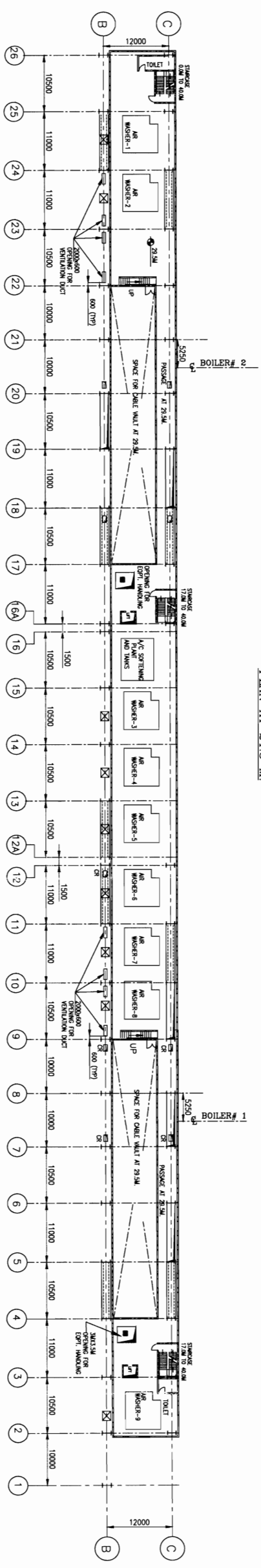
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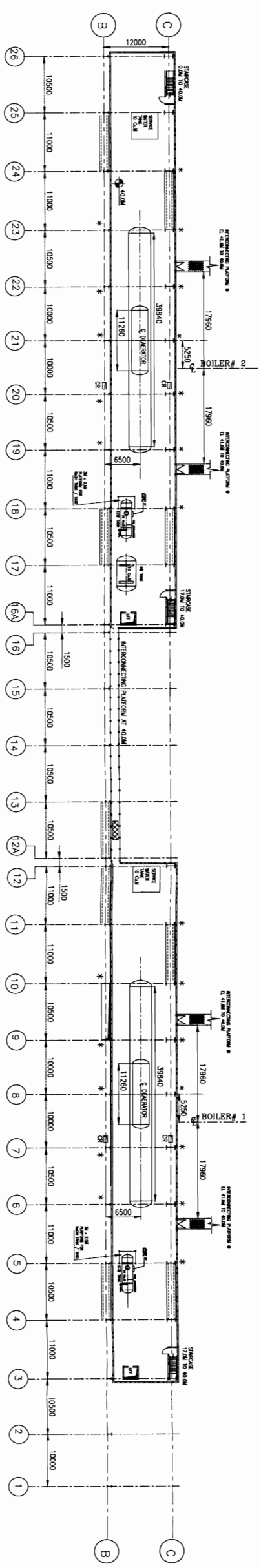




PLAN AT 24.5 M.



PLAN AT 29.5 M.



PLAN AT EL. 40.0M

NOTES:-

1. ALL DIMENSION ARE IN MM AND LEVELS ARE IN METRES.
2. ALL ELEVATION MARKED ARE W.R.T. TO HALL GROUND FLOOR ELEVATION OF 0.00M WHICH CORRESPONDS TO RL 352.0M.
3. SIZES OF TOILETS & STAIRS ARE INDICATIVE AND THESE WILL BE FINALIZED DURING CIVIL DETAILING.
4. DIMENSIONS OF TANKS ARE INDICATIVE.
5. DETAILS FOR AIR WISHER ARE INDICATIVE.

REFERENCE DRGS.

SL. NO	TITLE	NUMBER	REVISION	UNIT
1	T.G. HALL CROSS SECTION	PE-DG-362-100-A007	2	PEM
2	TG EQUIPMENT PLAN AT EL. 0.0 M	PE-DG-362-100-A003	2	PEM
3	TG EQUIPMENT PLAN AT EL. 8.5 M	PE-DG-362-100-A004	2	PEM
4	TG EQUIPMENT PLAN AT EL. 17.0 M	PE-DG-362-100-A005	2	PEM
5	GA OF DEGENERATOR	1-163-10-11374	01	HVO

PROJECT  
24800MW YERRAVALU SUPERCRITICAL TPP  
RAICHUR POWER CORPORATION LIMITED  
(A JVC OF KPCL & BHEL)  
EVONIK ENERGY SERVICES (INDIA) LTD

PRODUCT  
24800MW YERRAVALU SUPERCRITICAL TPP

CLIENT  
RAICHUR POWER CORPORATION LIMITED  
(A JVC OF KPCL & BHEL)

DESIGNER  
BHRAT HEAVY ELECTRICALS LTD  
POWER GROUP  
PROJECT MANAGEMENT

TITLE  
TG EQUIPMENT PLAN AT  
MISCELLANEOUS FLOORS IN BC BAY

SCALE  
1:100

DATE  
10/01/2024

BY  
S. K. S. S.

CHECKED BY  
S. K. S. S.

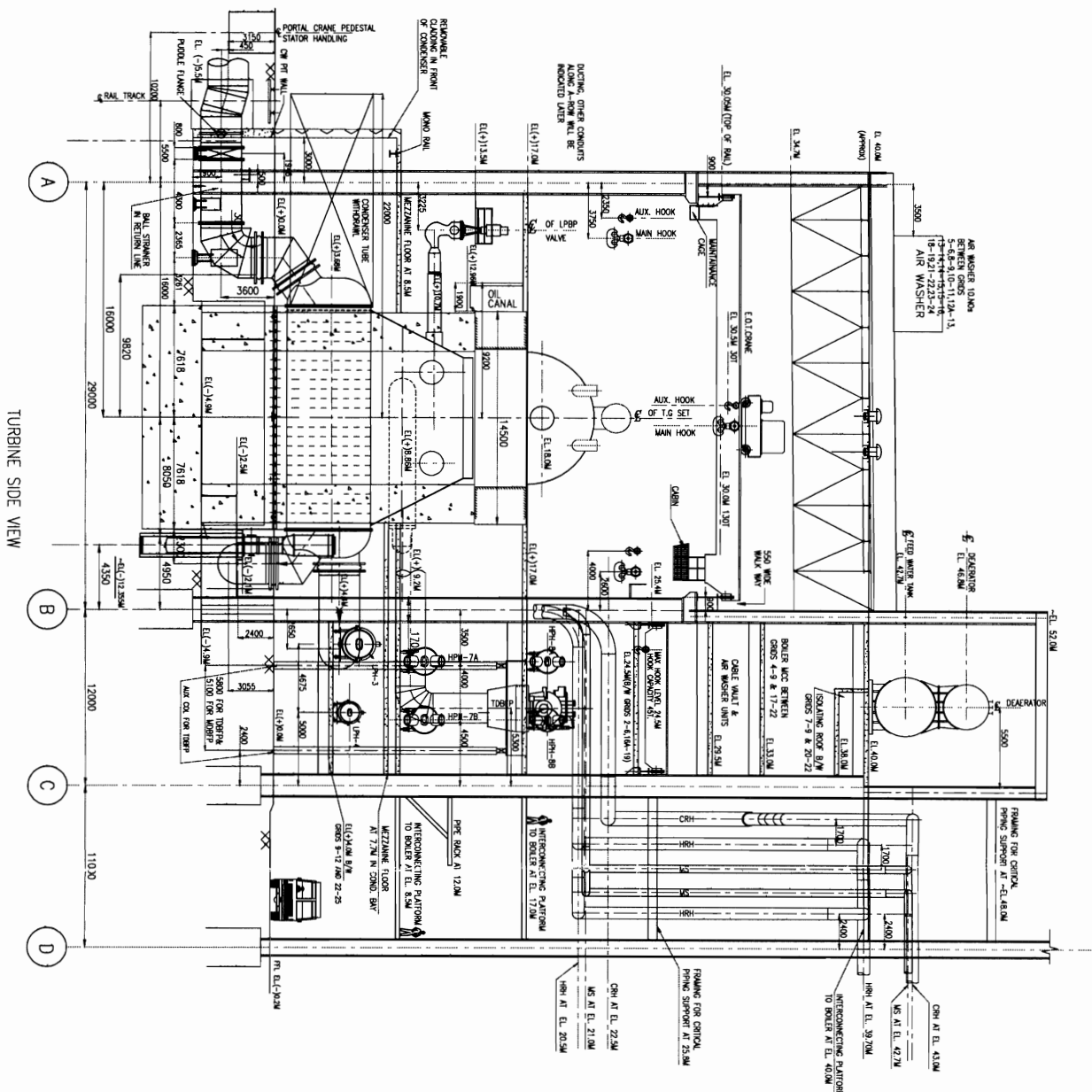
APPROVED BY  
S. K. S. S.

PROJECT NO.  
PE-DG-362-100-M006

DATE  
10/01/2024

BY  
S. K. S. S.












NO.	DATE	DESCRIPTION
01	10/01/2024	ISSUED FOR APPROVAL
02	10/01/2024	ISSUED FOR APPROVAL
03	10/01/2024	ISSUED FOR APPROVAL
04	10/01/2024	ISSUED FOR APPROVAL
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TURBINE SIDE VIEW

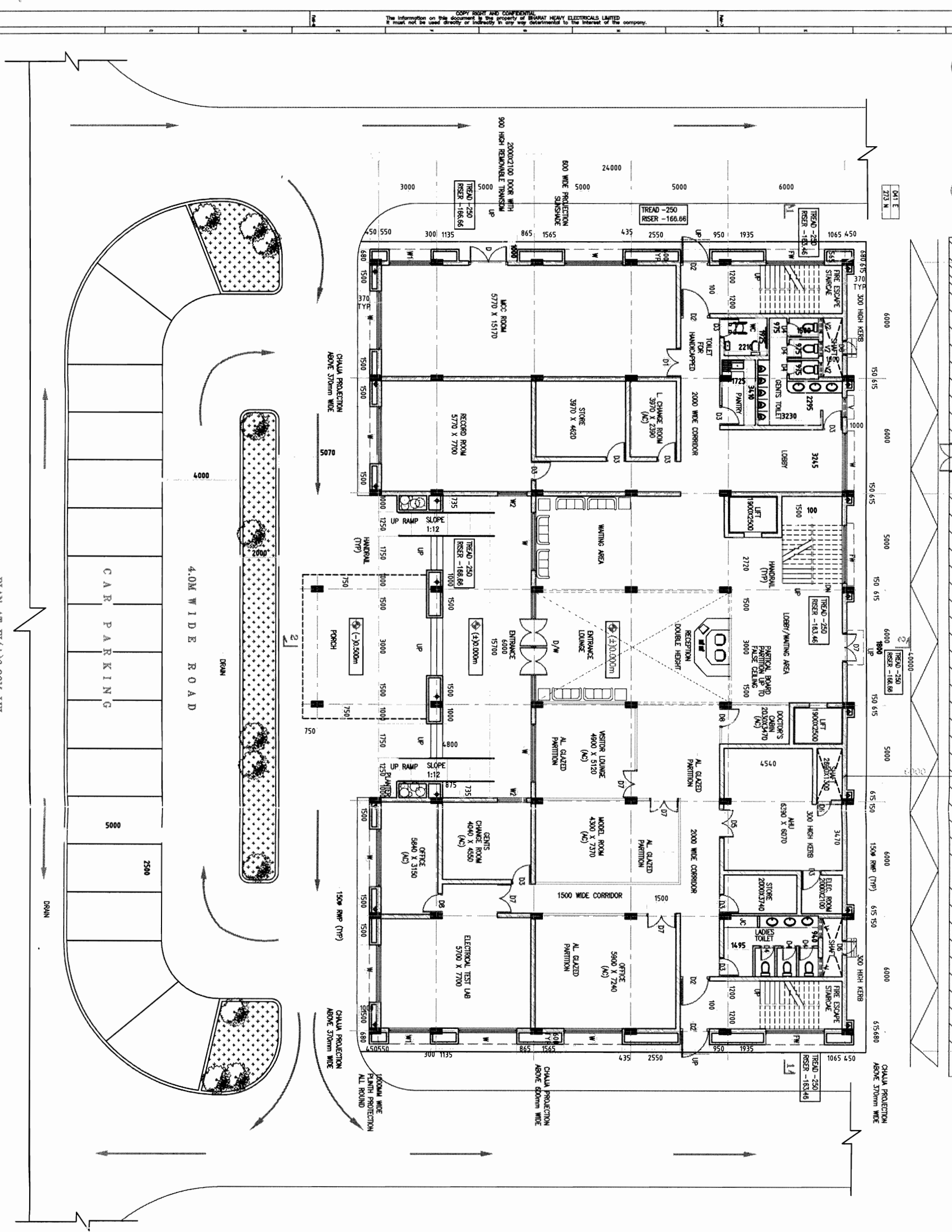
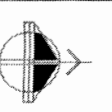
REFERENCE DRGS.			
Sr. NO	TITLE	NUMBER	REVISION
1	TG EQUIPMENT PLUMB IN 1.0.0 M	P4-00-343-100-0003	02
2	TG EQUIPMENT PLUMB IN 1.0.0 M	P4-00-343-100-0004	02
3	TG EQUIPMENT PLUMB IN 1.1.7 M	P4-00-343-100-0005	02
4	TG EQUIPMENT PLUMB IN 1.0.0 M	P4-00-343-100-0006	02
5	CCO OF 130' AS TIT PLUMB CHAIN	P4-00-343-101-0001	01
6	CCO OF 45' IN RIG BAY CHAIN	-	AWAITED

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METRES.
2. ALL ELEVATIONS MARKED ARE W.R.T. TO WALL GROUND FLOOR ELEVATION OF 0.0M WHICH CORRESPONDS TO RL 362.0M.
3. ALL THE SIZES AND LOCATIONS OF COLUMNS OR TO DECK ARE SUBJECT TO FINALIZATION AFTER CIVIL DESIGN.
4. SIZES OF ALL TG BUILDING MAIN AND AUXILIARY COLUMNS ARE SUBJECT TO CIVIL DESIGN.
5. GRANT DETAILS ARE INDICATIVE.

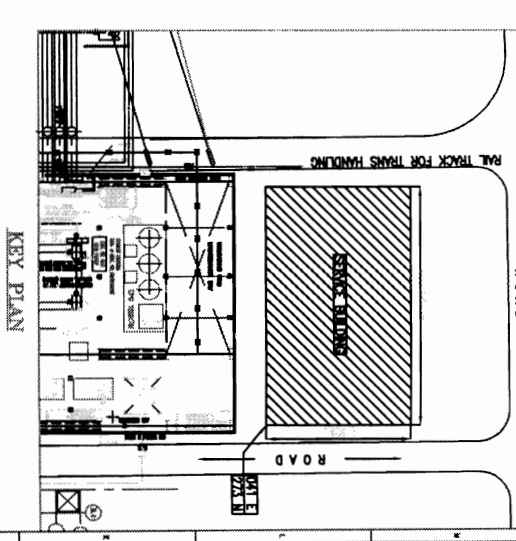
LEGEND	
	PIPE HATCH
	VERTICAL BRACING
	FIRE PROOF DOOR
	GRATING
	CHECKERED PLATE
	REMOVABLE
	HAND RAILING
	PIPE & CABLE TRETTLE
	FIRE BARRIER WALL
	INDOCKIES PIPES/CABLE TRETTLE
	ROLLING SHUTTER

[illegible]





PLAN AT EL+10.00M LVL



NOTES :

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION
2. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN M. UNLESS NOTED OTHERWISE
3. ALL ELEVATIONS ARE WITH RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL+(3.00) M. WHICH CORRESPONDS TO RL +362.00 M. ABOVE M.S.L.
4. FOR GENERAL NOTES REFER DRAWING NO.-PE-06-362-611-0001 & PE-06-362-612-0001
5. ALUMINIUM GLAZED & PARTIALLY BOARD PARTITIONS ARE NOT IN SHEL SCOPE. PARTITIONS SHOWN IN PLAN ARE ONLY FOR PLANNING PURPOSE.

REFERENCE DRAWINGS:-

1. PLOT PLAN----- RPQ-TYPE-ANVT-001
2. ARCH. PLAN AT EL+4.250M----- PE-06-362-640-0002
3. ARCH. PLAN AT EL+8.500M----- PE-06-362-640-0003
4. ARCH. PLAN AT EL+12.750M----- PE-06-362-640-0004
5. ARCH. PLAN AT EL+17.00M----- PE-06-362-640-0005
5. ARCH. PLAN AT EL+21.250M----- PE-06-362-640-0006

LEGEND:

- AC : AIR CONDITIONING
- RWP : RAIN WATER PIPE
- BRICK WALL
- CONCRETE
- GRASS
- PLANTATION

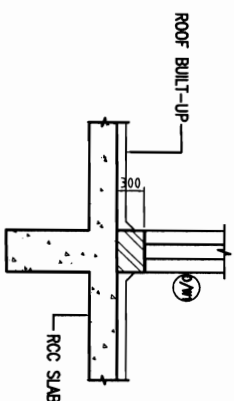
JOB NO.	362
STATUS	CONTRACT
CLIENT	YERNARUS THERMAL POWER PROJECT
PROJECT	YERNARUS THERMAL POWER PROJECT
DESIGNER	M/S. RAJCHUR POWER CORPORATION LIMITED
CHECKED	M/S. EVONIK ENERGY SERVICES (INDIA) LTD
APPROVED	(A JVC OF RPCL & BHEL)
DATE	25/06/07
UNIT NO.	162
PROJECT	YERNARUS THERMAL POWER PROJECT
DESIGNER	M/S. RAJCHUR POWER CORPORATION LIMITED
CHECKED	M/S. EVONIK ENERGY SERVICES (INDIA) LTD
APPROVED	(A JVC OF RPCL & BHEL)
DATE	25/06/07
UNIT NO.	162
PROJECT	YERNARUS THERMAL POWER PROJECT
DESIGNER	M/S. RAJCHUR POWER CORPORATION LIMITED
CHECKED	M/S. EVONIK ENERGY SERVICES (INDIA) LTD
APPROVED	(A JVC OF RPCL & BHEL)
DATE	25/06/07

GENERAL REMARKS	
ARCHITECTURAL PLAN AT EL+0.00M	
SERVICE BUILDING	
PE-06-362-640-0001	
Nov 14, 2011 - 2:24pm	



12

**SECTION 4-4**  
**NTS**

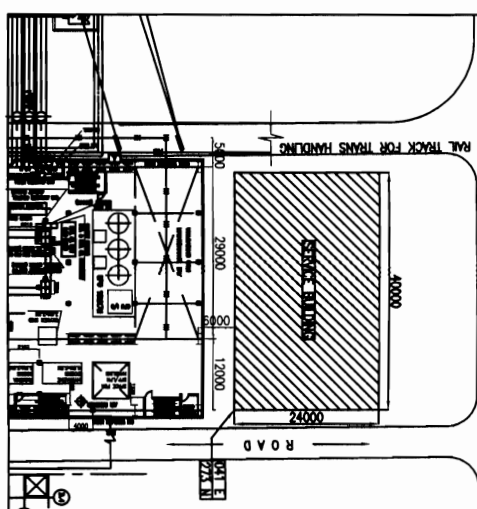


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1. PGR PLAM	PRG-775-LAMU-00
2. MGR PLAM AT EL+0.00M	FE-00-382-640-C001
3. MGR PLAM AT EL+8.50M	FE-00-382-640-C003
4. MGR PLAM AT EL+12.75M	FE-00-382-640-C004
5. MGR PLAM AT EL+17.00M	FE-00-382-640-C005
5. MGR PLAM AT EL+21.25M	FE-00-382-640-C006

AC	:	AIR CONDITIONING
RWP	:	RAIN WATER PIPE
	:	BRICK WALL
	:	CONCRETE

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION
2. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN M, UNLESS NOTED OTHERWISE
3. ALL ELEVATIONS ARE WITH RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL.(5)0.00 TO WHICH CORRESPONDS TO EL. +362.00 M. ABOVE M.S.L.
4. FOR GENERAL NOTES REFER DRAWING NO.-PE-02-362-611-0001 & PE-02-362-612-000
5. ALUMINUM GLAZED & PATTERN BOARD PARTITIONS ARE NOT IN BREL SCOPE.
6. PARTITIONS SHOWN IN PLAN ARE ONLY FOR PLANNING PURPOSE



## **KEY PLAN**

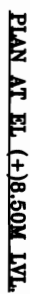
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NAME	PROPERTY ADDRESS
CITY/STATE	
DATE	OFFICIAL

**M/S. RAICHUR POWER CORPORATION LIMITED**  
(A JVC OF KPCL & BHEL)

**YERMARUS THERMAL POWER PROJECT**

**SERVICE BUILDING**  
**ARCHITECTURAL PLAN AT EL. +4.250M**

[illegible]NOV 17, 2011 1:00 PM  
FORNAT: S2X AI



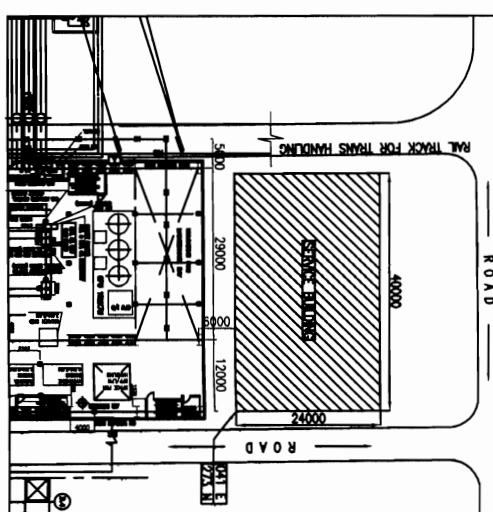
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It must not be used directly or indirectly in any way detrimental to the interest of the company.

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION
2. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN M, UNLESS NOTED OTHERWISE
3. ALL ELEVATIONS ARE WITH RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL.(E)0.00 M, WHICH CORRESPONDS TO EL. +350.00 M ABOVE M.S.L.
4. FOR GENERAL NOTES REFER DRAWING NO.-FE-00-302-611-0001 & FE-00-302-612-0001
5. MATERIALS GRADED & PAVEMENT BOARD PAVEMENTS ARE NOT IN BREL SCOPE.

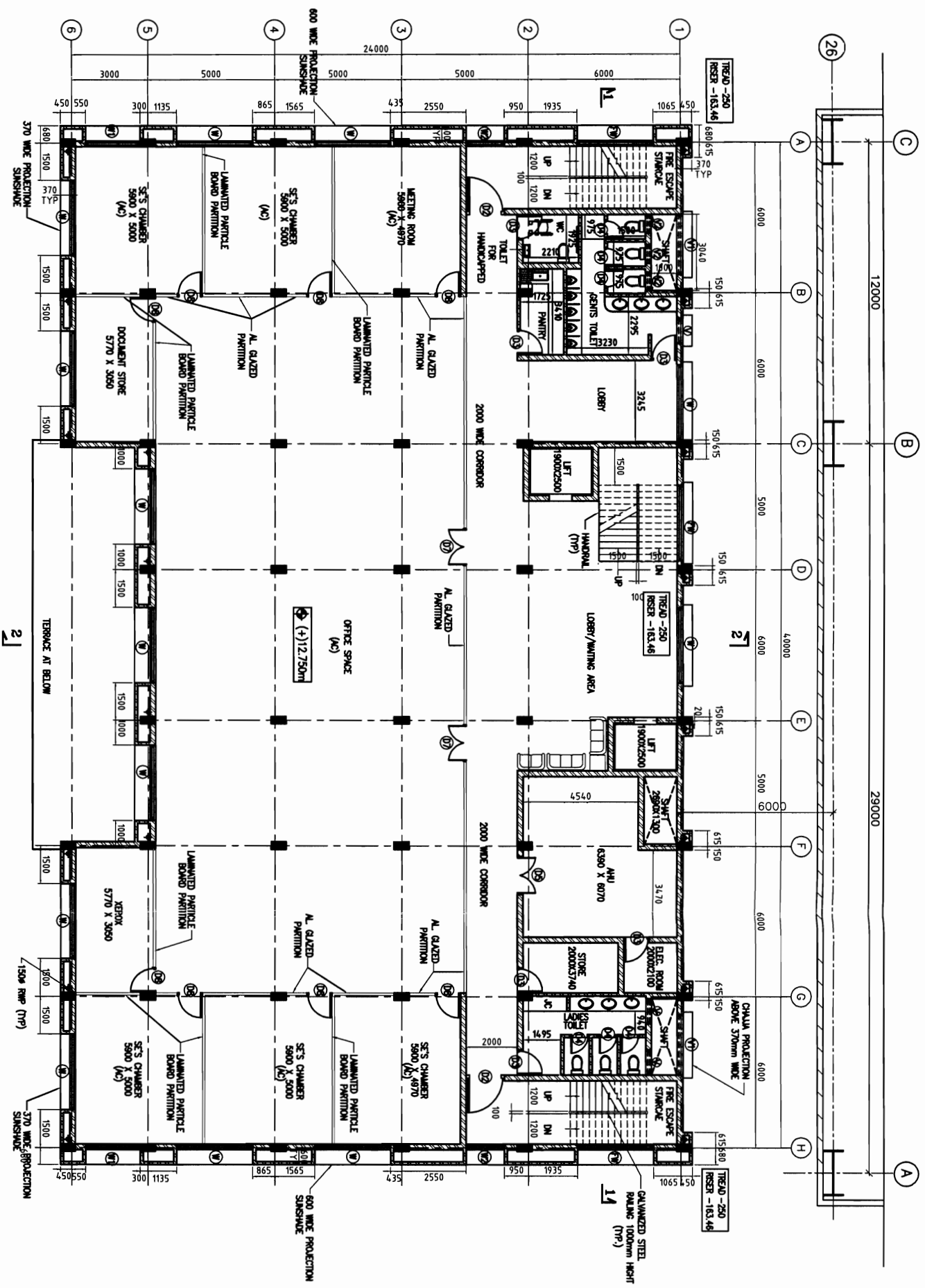
PAVEMENTS SHOWN IN PLAN ARE ONLY FOR PLANNING PURPOSE

1. PLOT PLAN	PR2-TTS-LN001-00
2. MCH. PLAN AT EL3.00M	FE-02-32-640-0001
3. MCH. PLAN AT EL+4.250M	FE-02-32-640-0002
4. MCH. PLAN AT EL+12.750M	FE-02-32-640-0004
5. MCH. PLAN AT EL+17.00M	FE-02-32-640-0005
5. MCH. PLAN AT EL+21.250M	FE-02-32-640-0006

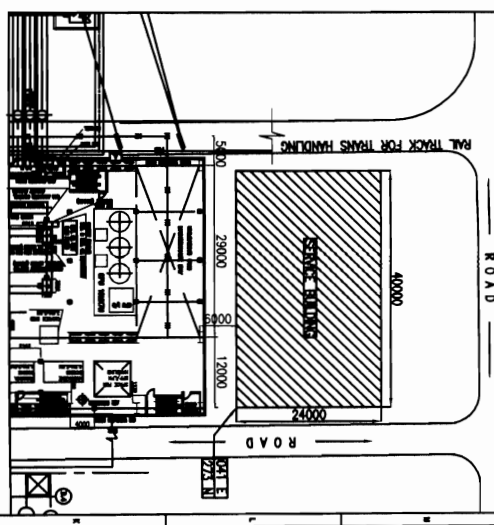
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RWP	:	RAIN WATER PIPE
	:	BRICK WALL
	:	CONCRETE

[illegible]

## KEY PLAN



PLAN AT EL. (+)12.750m



NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION
2. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN M. UNLESS NOTED OTHERWISE
3. ALL ELEVATIONS ARE WITH RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL.(+3)0.00 M. WHICH CORRESPONDS TO RL. +362.00 M. ABOVE M.S.L.
4. FOR GENERAL NOTES REFER DRAWING NO. PE-DC-362-611-001 & PE-DC-362-612-001
5. ALUMINIUM GLAZED & PARTITION BOARD PARTITIONS ARE NOT IN BREL SCOPE. PARTITIONS SHOWN IN PLAN ARE ONLY FOR PLANNING PURPOSE

REFERENCE DRAWINGS:-

1. FLOOR PLAN----- RPQ-YTPS-LANDU-001
2. ARCH. PLAN AT EL.+0.00M----- PE-DC-362-640-001
3. ARCH. PLAN AT EL.+4.250M----- PE-DC-362-640-002
4. ARCH. PLAN AT EL.+8.500M----- PE-DC-362-640-003
5. ARCH. PLAN AT EL.+12.00M----- PE-DC-362-640-005
6. ARCH. PLAN AT EL.+12.250M----- PE-DC-362-640-006

LEGEND:

- AC : AIR CONDITIONING  
RWP : RAIN WATER PIPE  
BWP : BRICK WALL  
CONC : CONCRETE

M/S. RAICHUR POWER CORPORATION LIMITED (A PVT. OF RPCL & BHEL)	
M/S. EVONIK ENERGY SERVICES (INDIA) LTD	
YERMARUS THERMAL POWER PROJECT (2200 MW)-UNIT NO. 1&2	
RELIANT HEAVY ELECTRICALS LTD (2200 MW)-UNIT NO. 1&2	
PROJECT ENGINEERING DEPARTMENT CHENNAI, INDIA	
DATE	2011-12-01
BY	2011-12-01
CHECKED	2011-12-01
APPROVED	2011-12-01

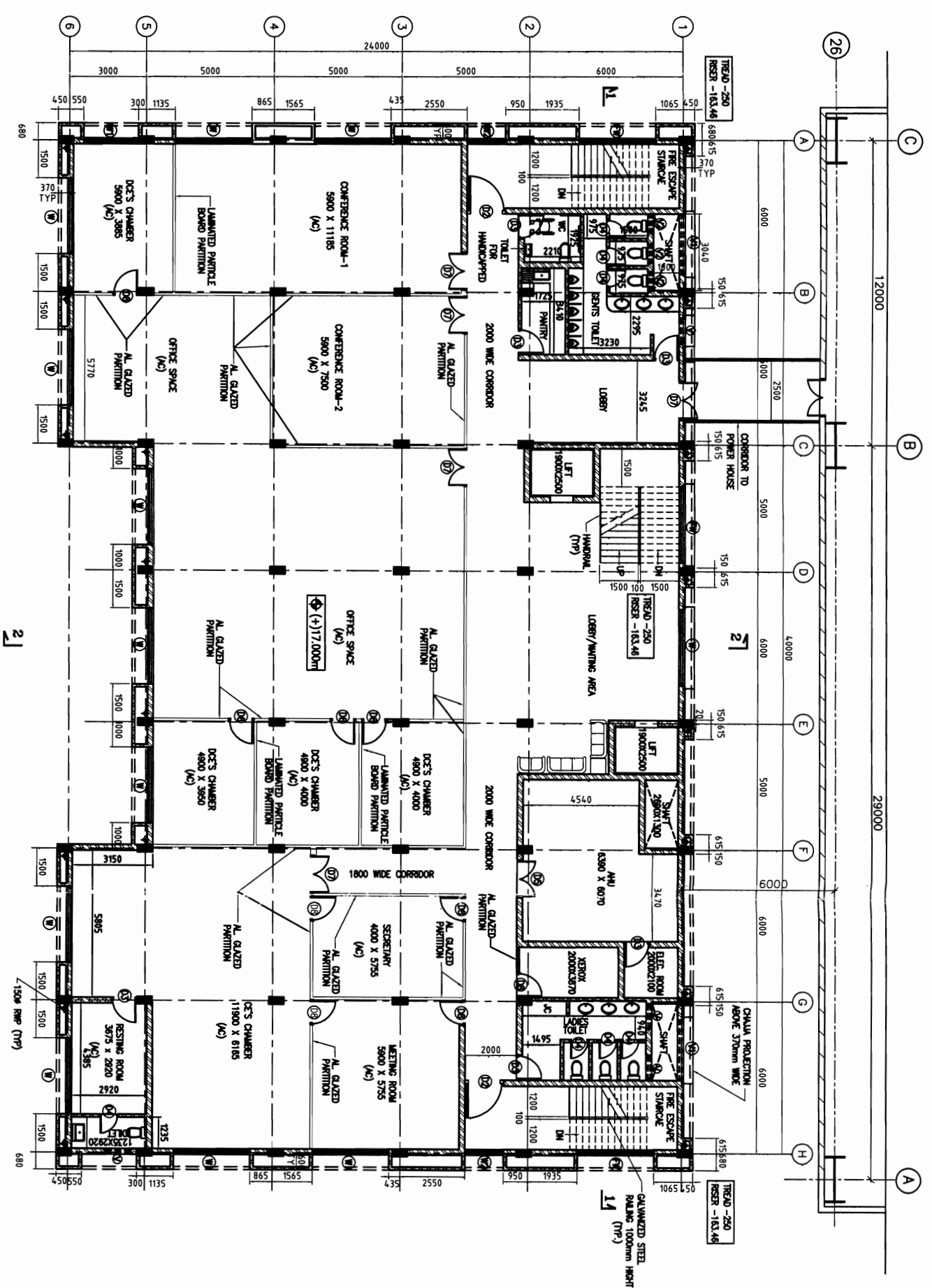
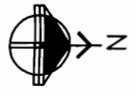
M/S. RAICHUR POWER CORPORATION LIMITED (A PVT. OF RPCL & BHEL)	
M/S. EVONIK ENERGY SERVICES (INDIA) LTD	
YERMARUS THERMAL POWER PROJECT (2200 MW)-UNIT NO. 1&2	
RELIANT HEAVY ELECTRICALS LTD (2200 MW)-UNIT NO. 1&2	
PROJECT ENGINEERING DEPARTMENT CHENNAI, INDIA	
DATE	2011-12-01
BY	2011-12-01
CHECKED	2011-12-01
APPROVED	2011-12-01

JOB NO.	362
STATUS	COMPLETED
DATE	2011-12-01
BY	2011-12-01
CHECKED	2011-12-01
APPROVED	2011-12-01

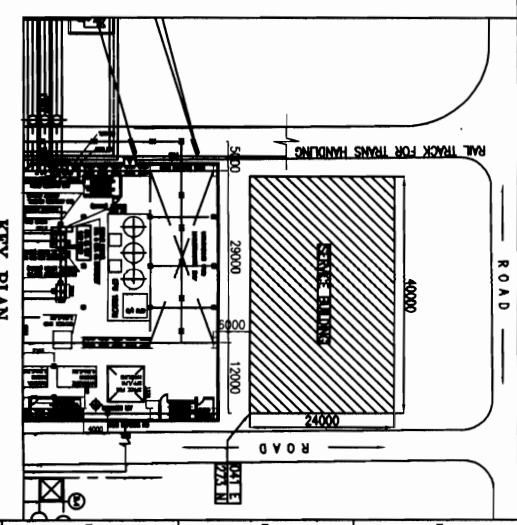
GENERALLY RENED

M/S. RAICHUR POWER CORPORATION LIMITED (A PVT. OF RPCL & BHEL)	
M/S. EVONIK ENERGY SERVICES (INDIA) LTD	
YERMARUS THERMAL POWER PROJECT (2200 MW)-UNIT NO. 1&2	
RELIANT HEAVY ELECTRICALS LTD (2200 MW)-UNIT NO. 1&2	
PROJECT ENGINEERING DEPARTMENT CHENNAI, INDIA	
DATE	2011-12-01
BY	2011-12-01
CHECKED	2011-12-01
APPROVED	2011-12-01





PLAN AT EL. (+)17.00M. LVL.



NOTES :

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION
2. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN M. UNLESS NOTED OTHERWISE
3. ALL ELEVATIONS ARE WITH RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL.(+10.00) M. WHICH CORRESPONDS TO R.L. +362.00 M. ABOVE M.S.L.
4. FOR GENERAL NOTES REFER DRAWING NO.-PE-00-302-611-C001 & PE-00-302-612-C001
5. ALUMINUM GLAZED & PARTICLE BOARD PARTITIONS ARE NOT IN BRICK SCOPE. PARTITIONS SHOWN IN PLAN ARE ONLY FOR PLANNING PURPOSES

REFERENCE DRAWINGS:-

1. PLOT PLAN----- RPL-015-UNIT-001
2. ARCH. PLAN AT EL.0.00M----- PE-00-302-640-0001
3. ARCH. PLAN AT EL.+4.250M----- PE-00-302-640-0002
4. ARCH. PLAN AT EL.+8.500M----- PE-00-302-640-0003
5. ARCH. PLAN AT EL.+12.75M----- PE-00-302-640-0004
5. ARCH. PLAN AT EL.+17.25M----- PE-00-302-640-0005

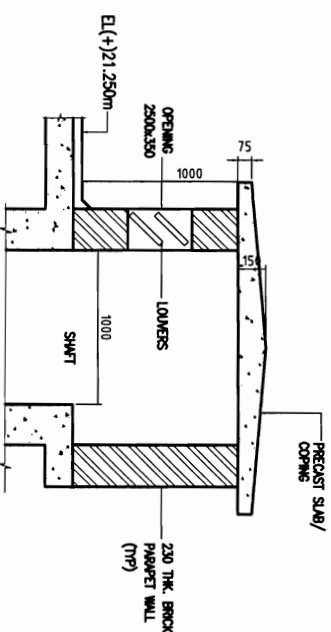
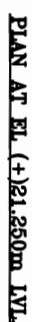
LEGEND:

- AC : AIR CONDITIONING  
RWP : RAIN WATER PIPE  
B : BRICK WALL  
C : CONCRETE

M/S. RAJCHUR POWER CORPORATION LIMITED (A PVT. OF EPECL & BHEL)	
M/S. EVONIK ENERGY SERVICES (INDIA) LTD	
YERMARUS THERMAL POWER PROJECT (2x600 MW)-UNIT NO. 1&2	
ARCHITECTURAL PLAN AT EL. +17.00M	
DATE	14.07.2011
BY	14.07.2011
CHECKED	14.07.2011
APPROVED	14.07.2011

JOB NO. 282	
STATUS : CONTRACT	
GENERAL REMARKS	
M/S. RAJCHUR POWER CORPORATION LIMITED (A PVT. OF EPECL & BHEL)	
M/S. EVONIK ENERGY SERVICES (INDIA) LTD	
YERMARUS THERMAL POWER PROJECT (2x600 MW)-UNIT NO. 1&2	
ARCHITECTURAL PLAN AT EL. +17.00M	
DATE	14.07.2011
BY	14.07.2011
CHECKED	14.07.2011
APPROVED	14.07.2011

JOB NO. 282	
STATUS : CONTRACT	
GENERAL REMARKS	
M/S. RAJCHUR POWER CORPORATION LIMITED (A PVT. OF EPECL & BHEL)	
M/S. EVONIK ENERGY SERVICES (INDIA) LTD	
YERMARUS THERMAL POWER PROJECT (2x600 MW)-UNIT NO. 1&2	
ARCHITECTURAL PLAN AT EL. +17.00M	
DATE	14.07.2011
BY	14.07.2011
CHECKED	14.07.2011
APPROVED	14.07.2011



### TYPICAL SHAFT DETAILS



	REC-7MS-LMOU-10
1. PLOT PLW----	
2. ARCH. PLW AT EL+0.00M----	FE-D0-302-640-C001
3. ARCH. PLW AT EL+0.250M----	FE-D0-302-640-C002
4. ARCH. PLW AT EL+0.500M----	FE-D0-302-640-C003
5. ARCH. PLW AT EL+1.25M----	FE-D0-302-640-C004
5. ARCH. PLW AT EL+17.00M----	FE-D0-302-640-C005

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION
2. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN M, UNLESS NOTED OTHERWISE
3. ALL ELEVATIONS ARE WITH RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL.(+0.00) M WHICH CORRESPONDS TO RL +362.00 M ABOVE M.S.L.
4. FOR GENERAL NOTICES REFER DRAWING NO.-PE-DC-362-611-C001 & PE-DC-362-612-C001
5. ALUMINUM GLAZED & PATTERAL BOARD PARTITIONS ARE NOT IN BRL SCORE.

PARTITIONS SHOWN IN PLAN ARE ONLY FOR PLANNING PURPOSE

AC	:	AIR CONDITIONING
RWP	:	RAIN WATER PIPE
	:	BRICK WALL
	:	CONCRETE

	<b>M/S. EYONIK ENERGY SERVICES (INDIA) LTD</b>
<b>PROJECT :</b>	<b>M/S. EACHUR POWER CORPORATION LIMITED (A JVC OF EPCL &amp; BHEL)</b>
<b>NAME :</b>	<b>M/S. YERRARU THERMAL POWER PROJECT (2x800 MW)-UNIT NO. 1&amp;2</b>
<b>CLIENT :</b>	<b>RELAYE RAYE INTERNATIONAL LTD</b>
<b>ADDRESS :</b>	<b>PLOT NO. 67, PULLECHERU VILLAGE, HYDRABAD-500009 (INDIA)</b>
<b>DATE :</b>	<b>NOV 2007</b>
<b>DRAWN BY :</b>	<b>MR. S. K. SURESH</b>
<b>CHECKED BY :</b>	<b>MR. S. K. SURESH</b>
<b>APPROVED BY :</b>	<b>MR. S. K. SURESH</b>
<b>SCALE :</b>	<b>AS SHOWN</b>
<b>SHEET NO. :</b>	<b>1 OF 1</b>

THE ABOVE WORK IS INTEND FOR	
<input checked="" type="checkbox"/> COMMERCE/INDUSTRIAL	
<input type="checkbox"/> PLANNING/RECREATION	
<input type="checkbox"/> CONSTRUCTION	
CHECK ALL PERTINENT REASONS AS APPLICABLE	
REASON	
REASON	APPLICABLE REASON
REASON	
REASON	
REASON	

