

sulphide solution is placed on a thick filter paper and it is allowed to soak. The spot is touched with a drop of above extract. A black spot indicates the presence of anti-termite & rodent compound.

5.03.00 Test Witness

Tests shall be performed in presence of Owner/'s representative if so desired by the Owner. The Contractor shall give at least thirty (30) days' advance notice of the date when the tests are to be carried out .

5.04.00 Test Certificates

5.04.01 Certified reports of all the tests carried out at the works shall be furnished for approval of the Owner.

5.04.02 Test reports shall be completed with all details and shall also contain IS specified limit values, wherever applicable, to facilitate review.

5.04.03 The cables shall be dispatched from works only after receipt of Owner/Purchaser's written approval of the test reports.

6.00.00 DRAWINGS, DATA & MANUALS

6.01.00 To be furnished after award of contract

- a) Manufacturer's catalogues giving cable construction details and characteristics.
- b) Cable current ratings for different types of installation, inclusive of derating factors for ambient temperature, grouping etc.
- c) Write-up on Manufacturer's recommended method of splicing, jointing, termination etc. of the cables.
- d) Type test report on all specified cables.
- e) Proposal Data as per Annexure.
- f) Confirmed cable data
- g) Test reports

6.02.00 To be submitted for Owner/Purchaser's Approval and Distribution

6.02.01 Guaranteed Technical Particulars.

6.02.02 Quality assurance plan.

6.02.03 Shop Test reports.

- 6.02.04 **Instruction manuals.**
- 6.02.05 The manual shall clearly indicate method of laying, termination, check-ups and tests to be carried out before commissioning.
- 6.03.00 The bidder may note that the drawings, data and manuals listed herein are minimum requirement only. The bidder shall ensure that all other necessary write-up, information, etc required to fully describe the cable are to be submitted with the bid.

ANNEXURE-I

H.V. POWER CABLES 3300V & 11000 V GRADE

3300/3300V & 11000/11000V grade 90°C continuous rating under normal condition and 250°C short time rating under short circuit condition XLPE insulated FRLSH sheathed heavy duty power cable suitable for use in 3300V & 11000V non-effectively earthed system conforming to following requirement and in line with IS 7098, IS 8130, IS 5831 and IS 3975.

DESCRIPTION	SPECIFICATON
Conductor	Stranded and compacted aluminium conductor of grade H2 and class 2 for all sizes, generally conforming to IS: 8130 shall be provided.
Conductor Screen	Cross linked semi-conducting compound extruded in the same operation as the insulation
Insulation	Cross linked polyethylene (XLPE) of natural color, extruded over screened conductor. This shall be conforming to IS: 7098 Part-2 (1985).
Insulation Screen:	All cables shall be provided with insulation screening. The insulation screening shall consist of extruded cross linked semi-conducting compound in combination with a layer of lapped copper tape of thickness not less than 0.1 mm.
Core Identification	Three (3) core cables, core identification shall not be done with different coloring of XLPE insulation, but with natural color with colored strips applied on the cores or by numerals printing on the cores.
Inner Sheath	Three (3) core cables, after laying up of cores, shall be provided with extruded FRLSH PVC compound inner sheath conforming to type ST2 of IS: 5831/1984. Such inner sheath shall be provided by pressure extrusion process without filler. However, if in the process, the centre filler is required, the same shall be provided and material of centre filler shall be the same as inner sheath material. Extruded FRLSH PVC compound conforming to type ST2 inner sheath shall also be provided for single core cables.
Armour	For Single Core Cables: - Armour shall be of Non magnetic material consisting of single hard drawn aluminium round wires conforming to H4 grade of IS: 8130 / 1984. For three (3) core cables: - The armouring shall be of galvanised steel wire / Strip.
Overall Sheath Drum	Extruded FRLSH PVC compound conforming to type ST2 of IS: 5831. Conforming to IS-10418 (Steel Drum

Note: For sizing of 11 kV incoming cable to FGD Switchgear from Station Transformer bidder shall consider the full load current of the Station Transformer as current carrying capacity of the cable.

L.V. POWER CABLES 1100 V GRADE

1100 V grade, 90°C continuous rating under normal condition and 250°C short time rating under short circuit condition XLPE insulated FRLSH sheathed heavy duty, power cable conforming to following requirement and in line with IS 7098, IS 8130, IS 5831 and IS 3975.

- | | | | |
|-----|---------------------|---|--|
| 1.1 | Conductor | : | Stranded and compacted plain aluminium of grade H2 and Class 2/stranded, high conductivity annealed plain copper generally conforming to IS: 8130. |
| 1.2 | Insulation | : | Extruded Cross-Linked polyethylene (XLPE) conforming to IS:7098 (Part-3) |
| 1.3 | Core Identification | : | By color coding |
| 1.4 | Inner Sheath | : | Extruded FRLSH PVC compound conforming to type ST2 of IS: 5831 for multicore cable. Single core cables shall have no inner sheath. |
| 1.5 | Armour | : | Galvanised single round steel wire armour for twin and multicore cables.

Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables. |
| 1.6 | Overall Sheath | : | Extruded FRLSH PVC compound conforming to type ST2 of IS: 5831. |
| 1.7 | Drum | : | Conforming to IS-10418 (Wooden drum) |

CONTROL CABLES

- 1.0 1100 V grade 70°C continuous rating under normal condition and 160°C short time rating under short circuit condition PVC insulated FRLSH sheathed control cable conforming to following requirement and in line with IS:1554, IS:8130, IS:5831 and IS:3975.
- 1.1 Conductor : Stranded, non-compacted & circular, high conductivity annealed plain copper, generally conforming to IS: 8130.
- 1.2 Insulation : Extruded PVC compound conforming to type A of IS: 5831.
- 1.3 Core Identification : By color coding and numbering at interval of 100mm or less
- 1.4 Inner sheath : Extruded FRLSH PVC compound conforming to type ST1 of IS: 5831 for multicore cables. Single core cables shall have no inner sheath. Filler shall be of same material as of inner sheath i.e. ST1.
- 1.5 Armour : Galvanized single round steel wire for twin and Multi-core cables.
- 1.6 Overall sheath : Extruded FRLSH PVC compound conforming to type ST1 of IS: 5831.
- 1.7 Drum : Conforming to IS: 10418 (Wooden drum)

1.1KV GRADE COPPER CONDUCTOR FS POWER CABLES

1100V, copper conductor, heat resisting insulation, extruded inner sheath of low smoke and very low halogen content fire resisting material, single layer of copper wire armour for single core / single layer of round galvanized steel wire for multicore, outer sheath of low smoke and very low halogen content fire resistant material, suitable for minimum temperature of 750 deg.C for 3 hours. The cables shall be in compliance with IEC-60331, Part 11

1.1KV GRADE COPPER CONDUCTOR FS CONTROL CABLES

1100V, copper conductor, heat resisting insulation, extruded inner sheath of low smoke and very low halogen content fire resisting material, single layer of copper wire armour for single core / single layer of round galvanized steel wire for multicore, outer sheath of low smoke and very low halogen content fire resistant material, suitable for minimum temperature of 750 deg.C for 3 hours. The cables shall be in compliance with IEC-60331, Part 11.

FLEXIBLE TRAILING CABLES (AS APPLICABLE)**1100V Grade**

1100 V Grade trailing cable shall be plain copper of Class-5 of IS-8130, heat resistant elastomeric compound based on EPR insulation, inner sheath of heat resistant elastomeric compound PCP sheath, nylon cord reinforcement and heat resistant, oil resistant and flame retardant heavy duty elastomeric compound FRLS CSP outer sheath.

~~CABLING, GROUNDING AND
LIGHTNING PROTECTION SYSTEM~~

CABLING, GROUNDING AND LIGHTNING PROTECTION SYSTEM

1.00.00 SCOPE OF WORK

1.01.00 The Scope of Work covers complete and efficient design, engineering, testing at manufacturers works, supply, transportation erection, testing and commissioning of lightning protection system, all cabling and electrical grounding works. The scope shall broadly cover, but not be limited to:

1. Limestone Handling Area
2. Gypsum Handling Area
3. Absorber Area
3. All auxiliary buildings (including electrical rooms of respective buildings) and structures within the FGD package like Limestone preparation building, Absorber pump house, Gypsum De-watering building, FGD Control building, etc. as detailed in the Lead Specification & Plot Plan.
4. Overhead cable trestle and pipe cum cable trestle, if any.
5. All electrical equipment as described in Volumes II-F.

The scope of work shall also include all civil and structural works necessary for successful installation and commercial operation of all electrical equipment to be erected under this specification.

2.00.00 SCOPE OF SUPPLY

2.01.00 The scope of supply shall include but not be limited to the followings:

2.01.01 Timely procurement and transportation to site in properly packed condition of all materials and miscellaneous items required to complete the erection work under this specification.

These materials and miscellaneous items shall include but not be limited to the following:

- a) Galvanized steel pre-fabricated cable trays, coupler plates, nuts, bolts & washers, reducers, covers, wall brackets, hanger clamps, straight run, elbows, bends, etc.

- b) Galvanised steel rigid/flexible conduits and accessories, ferrules, lugs, glands, terminal blocks, galvanised sheet steel junction boxes, cable fixing clamps, nuts & bolts etc. as required.
- c) Cable termination and jointing kits as necessary.
- d) All necessary erection materials, consumables and sundry items including arc welding rods to complete the installation for satisfactory and trouble free operation.
- e) Mild steel rods for grounding conductor, grounding electrode, column & structure grounding, risers etc.,
Mild steel rod for vertical air terminals,
Materials for electronic grounding,
Galvanized steel flats for horizontal air terminals, for down conductors and for large equipment grounding
Galvanized wire (8SWG) for small equipment grounding.
- f) Any item of works or erection materials which have not been specifically mentioned but are necessary to complete the work involved shall be deemed to be included in the scope of this specification and shall be furnished by the Bidder without any extra charge to the Purchaser.

Scope of Services

- 2.02.00 The scope of Cabling, Grounding and Lightning Protection Systems includes but is not limited to the following:
- 2.02.01 Furnishing of all erection tools and tackles, testing equipment, implements, supplies, hardware and transport for timely and efficient execution of the erection work. Hydraulic jacks or motorized jacks necessary for lifting of heavy equipment shall be provided by the contractor.
- 2.02.02 Transport vehicles necessary for efficient transportation of equipment from stores to site of erection and excess materials back to stores.
- 2.02.03 A general list of the outdoor and indoor Electrical Equipment with accessories for complete assembly, erection and connection, testing and commissioning, putting into successful and satisfactory commercial operations by the contractor and as applicable in a FGD plant is given below. Since plant configuration varies from project to project, actual equipment and accessories shall also be guided by other specification documents.
 - a) 220/11.5/11.5kV Station Transformer
 - b) HT Aux. Transformers for FGD system
 - c) L.T. Transformers (dry)
 - d) Lighting Transformers

- e) Neutral Grounding Resistor Cubicles
 - f) 3.3Kv & 11kV Busducts
 - g) 415 V Busduct
 - h) 11kV & 3.3kV Switchgears
 - i) 415 V Switchgears, Switchgear cum MCCs.
 - j) Motor Control Centres, A.C./D.C. Distribution boards, Main lighting distribution boards and miscellaneous items.
 - k) Battery and Battery Chargers, Uninterrupted Power Supply Panels
 - l) Electrical Control Desks/Panels, Relay Panels, Data logger Panels etc.
 - m) Miscellaneous Local Panels.
 - n) All electrical equipment and systems integral with mechanical equipment, systems and subsystems.
 - o) Any other equipment, not mentioned herein but required for the completing the Plant shall be deemed included in the scope.
- 2.02.06 Erection work of equipment shall be carried out in a neat and efficient way so as not to impair their normal functioning in any way.
- 2.02.07 Pre-commissioning checks as well as commissioning of different equipment shall be carried out as per guidance of actual manufacturer's supervisor and or as per written instructions in Erection Manuals. In case of any site related problem in commissioning activities, contractor shall seek advice of the OE.
- 2.02.08 All erection work under this specification shall be carried out strictly in accordance with the approved drawings.
- 2.02.09 Erection work shall also be performed with respect to the following items:
- a) Cable trays and accessories
 - a) Power cables
 - b) Cables laid directly buried in ground
 - c) Control, instrument and special cables
- 2.03.00 All materials and accessories to be supplied by the Bidder shall be brand new ones of reputed make.
- 2.04.00 Necessary drawings, data sheets and Technical leaflets on each piece of material.
- 3.00.00 GENERAL REQUIREMENTS**

3.01.00 Codes and Standards

3.01.01 All cable and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

3.01.02 Cable and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

3.01.03 The electrical installation shall meet the requirements of Indian Electricity Rules as amended up to date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

3.02.00 Erection Schedule

3.02.01 The entire erection work shall be carried out in a phased manner. A schedule of the work showing the sequence of erection shall be submitted by the tenderer for this purpose.

3.02.02 The erection schedule, as approved by the Owner's Engineer shall be strictly followed by the Bidder. If, for any reason beyond the control of the Bidder, the work is held-up then the Bidder shall bring it to the notice of the Owner's Engineer without any delay.

4.00.00 DESIGN CRITERIA**4.01.00 Grounding System**

4.01.01 The main objectives of grounding system are to:

- a) Provide safety to personnel from contact of dangerous potential caused by ground fault.
- b) Ensure sufficient grounding current for effective relaying.
- c) Stabilize circuit potential with respect to ground.
- d) The grounding system shall be designed in compliance with the IEEE-80/ IEEE- 665 considering fault current of 50kA for 1 sec. and shall be subject to approval of the Owner.
- e) Major items of equipment, such as switchgear, transformer, motor, relay panels and control panels etc shall have integral ground buses or connection points which shall be connected to the underground grid.
- f) Electronic panels and equipment, where required, shall be grounded utilizing an insulated ground wire connected in accordance with the manufacturer's recommendations. Where practical, electronics ground loops shall be avoided. Where this is not practical, isolation

- 4.02.04 For metal structures which are electrically continuous down to the ground level, no lightning protection is required except adequate grounding connections.
- 4.02.05 **System Design**
- a) Air termination network with down conductors and earthing electrodes shall be provided on the basis of IS Code of Practice.
 - b) Horizontal air termination shall be so laid out that no part of the roof shall be more than 9 meters from the nearest conductor.
 - c) Shielding angle for one vertical air termination shall be 45 degrees. For more than one rod, shielding angle between the rods shall be taken as 60 Degrees.
 - d) Down conductors shall run along the outer surfaces of the building and shall have a test joint about 1500 mm above ground.
 - e) An earth electrode shall be provided at the connection point of the down conductor with the station ground.
 - f) Galvanised steel rods and flats shall be generally used for air termination and connections. All connections shall be welded type.
 - g) All other ancillary items in connection with the work described above shall be furnished to complete the work irrespective of whether such items may have been specifically mentioned or not.
- 4.02.06 All materials and accessories to be supplied by the Bidder shall be brand new ones of reputed make.
- 4.03.00 **Cabling System**
- 4.03.01 Erection of cabling work shall be carried out in such a way as to provide a reliable and assured electric power supply system to all FGD auxiliaries.
- 4.03.02 Cable routing shall be done on unit basis as far as possible.
- 4.03.03 Cables shall generally be laid on cable trays overhead supported from building steel/structures. Cables shall be run in concrete trenches in those electrical rooms at ground level, which are without any spreader room below.
- 4.03.04 For inter plant connections, the cables shall be routed through an overhead cable bridge pipe cum cable bridge. For isolated but long outdoor cable route with very few cables of 3/4 nos., the cables may be directly buried subject to Owner's approval.
- 4.03.05 For underground crossing of railways, road etc. additional protection shall be provided in form of hume pipe or concrete encased rigid steel conduits (duct bank).

- 4.03.06 A.C. and D.C. circuit shall not be run in same cable. Further, separately fused circuit shall run in separate cables.
- 4.03.07 Cables for redundant equipment system shall be run in separate trays, as far as possible.
- 4.03.08 Erection of cabling work shall be executed keeping in view all necessities and requirements.
- 4.03.09 Suitable embedded steel inserts shall be provided on wall/floor/ ceiling surfaces for welding of cable tray bracket in order to make the cable tray system withstand horizontal/vertical accelerations due to seismic forces for indoor trays and also wind load for outdoor trays in addition to normal tray cable loadings.
- 4.03.10 All erection work to be carried out under this specification shall conform to the notes and details given in Annexure-A to this specification.
- 5.00.00 SPECIFIC REQUIREMENTS - SUPPLY**
- 5.01.00 Equipment and Material**
- 5.01.01 Equipment and material shall comply with description, rating, type and size as detailed in this specification, drawings and annexures.
- 5.01.02 Equipment and materials furnished shall be complete and operative in all details.
- 5.01.03 All accessories, fittings, supports, hangers, anchor bolts etc. which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.
- 5.01.04 All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.
- 5.03.00 Conduits and Accessories**
- 5.03.01 The contractor shall provide and install all conduits, mild steel pipes, flexible conduits, rigid PVC pipes, etc. complete with accessories like tees, bends, adopters, locknuts, pull boxes, conduit plugs, caps, etc as required for the cabling work. Conduits shall be furnished in standard length of 5 metres, threaded at both ends.
- 5.03.02 Conduits diameter upto and including 25mm size shall be of 16 SWG and conduits above 25 mm diameter shall be of 14 SWG. Minimum diameter of conduits shall be 20 mm.
- 5.02.03 Conduits shall be made of hot-dip galvanized steel with an organic corrosion resistant ID coating. In chemical handling areas, battery room, etc., the

exterior surface shall be further coated with chromate and polymer for better resistance to corrosion. Conduits, fittings & accessories shall have ISI mark.

- 5.02.04 For sizes above 63 mm, hot dip galvanized - both on inside and outside - steel pipes with necessary fittings & accessories shall be provided and installed by the contractor. The pipes and fittings shall be of heavy duty class with relevant ISI mark.
- 5.02.05 Flexible conduits complying to relevant IS and made with bright, cold-rolled, annealed and electro-galvanized mild steel strips shall be used between embedded conduits/pipes and the motor terminals. It shall also be used between fixed conduit and any equipment with vibration or equipment requiring regular removal.
- 5.02.06 Non-metallic conduits made of HDPE outer jacket with friction-reducing permanent internal lining shall generally be used for control & instrumentation cables in some areas where cable trays do not exist and where the runs are straight ones Necessary fittings & accessories as may be required for the installation shall also be provided.
- 5.03.00 **Junction Boxes**
- 5.03.01 Technical requirement for both non-metallic type and galvanized steel Junction Boxes are given below. Unless the choice is specifically mentioned in the General / Lead Electrical Specification or elsewhere in the tender document, galvanized steel Junction Boxes shall be offered.
- 5.03.02 Non-metallic Junction Boxes
- a) Material of the Junction Boxes shall be halogen-free and silicon-free, glass fibre-reinforced polycarbonate for outdoor use and/or for cable sizes more than 50 sq.mm. Material shall be ABS/ polycarbonate for indoor use and/or for cable sizes upto 50 sq. mm. Junction boxes for use with fire-survival cables shall be of Duro-plast / powder-coated metal.
 - b) Material of all non-metallic junction boxes shall be fire retardant and self-extinguishing in accordance with UL 94 V0. It should be tested at Glow Wire test for 960° C.
 - c) Boxes shall be suitable for continuous operation at an ambient temperature range of -10° C to +80° C.
 - d) The impact strength of polycarbonate enclosures/boards i.e. the degree of protection against mechanical shock load shall be in accordance with EN 50298-98 for IK 08 (5 Joule).
 - e) Degree of protection shall be IP 66 to EN 60529. Junction boxes shall have integrally embedded gaskets made of Polyurethane.
 - f) Allowing a minimum of 20% spare terminals after complete termination, the terminal board for control and instrumentation JBs shall have 6 / 12 / 24 / 36 / 48 ways.
 - g) Doors shall have stainless steel quick fastening screws.

- h) The boxes shall be complete with all brackets/fasteners as required for installation on walls, columns and structure.

5.03.03 **Steel Junction Boxes**

- a. Junction boxes with IP 55 degree of protection, shall comprise of a rectangular parallelepiped case constructed from cold rolled sheet steel of minimum thickness 2mm. Top of the box shall be arranged to slope towards the rear of the box. Gland plate shall be 3mm thick sheet steel with neoprene/synthetic rubber gaskets. All junction boxes shall be of adequate strength and rigidity, hot dip galvanized as per relevant IS, and suitable for mounting on wall, column, structures etc. The boxes shall be complete with M8 earthing stud and all brackets/fasteners as required for installation.
- b) No. of Ways: 6 / 12 / 24 / 36 / 48 with 20% spare terminals after termination.
- c) Outdoor JB's shall be similar but with a canopy at the top.
- d) Doors shall be hinged and lockable and shall be made of the same material as the case. The doors shall have industrial heavy-duty hinges. The doors shall be easily but firmly lockable with quick release fastener.

5.03.04 **The junction boxes shall have the following indelible markings:**

- Circuit nos. on top by white-stenciled paint at site.
- Circuit nos. with ferrules (inside) as per approved drawing.
- Danger sign in case of 415 V circuit.

5.04.00 **Terminals**

5.04.01 Multiway terminal blocks of approved type, complete with screws, nuts; washers and marking strips shall be furnished for connection of incoming/outgoing wires.

5.04.02 Each control cable terminal shall be suitable for connection of 2 nos. 2.5 sq.mm. stranded copper conductors without any damage to the conductor or looseness of conductors.

5.05.00 **Cable Termination & Straight Through Joints**

5.05.01 Bidder shall supply cable termination and jointing kits in requisite quantity for H.T. Power Cables, L.T. Power, Control Cables, Instrumentation Cables, etc. along with all accessories & consumables required for making termination and joints complete. Those shall be of proven design and make which have already been extensively used and type tested.

- 5.05.02 Components shall be pre-moulded type, taped type or heat-shrinkable type. 11kV, 6.6kV and 3.3kV grade joints and terminations shall be type tested as per IS: 13573.
- 5.05.03 Kits shall be complete with the aluminium solderless crimping type cable lugs and ferrule as per DIN standard.

5.06.00 Cable Glands

Cable shall be terminated using double compression type cable glands. Cable glands shall conform to BS 6121 or to EN 50262. Ingress Protection rating for cable glands with seal, when offered conforming to EN 50262, shall be minimum IP 66 in line with BS. Cable glands shall be made of tinned brass gland, double compression type complete with necessary armour clamp and tapered washer, etc. Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall match with the sizes of different H.V./L.V./Control cables supplied/erected.

5.07.00 Cable Lugs

All cable lugs shall be Cd plated copper. Cable lugs shall be suitable for termination of different cross-sections of H.V./L.V./Control/Instrumentation cables and shall be of following types :

- i) Aluminium tubular terminal end for solderless crimping to aluminium conductors.
- ii) Copper tubular terminal end for solderless crimping to copper conductors.

Solderless crimping of terminals shall be done by using corrosion inhibiting compound. The cable lugs shall suit the type of terminals provided on the equipment. Lugs for control/instrumentation cables shall be PVC insulated/sleeved type.
- iii) Cable lugs for control cable termination shall be insulated. These lugs shall be pin type/flat type/ring type/U type to suit the terminals provided in the panels.

5.08.00 Cable Clamps and Straps

- 5.08.01 Trefoil clamps for single core cables shall be pressure die-cast aluminium or fibre glass or nylon with necessary G I fasteners. Trefoil clamps shall have adequate mechanical strength to forces generated by peak value of maximum system short circuit current.
- 5.08.02 Cable clamps required for multicore cables on vertical run shall be made up of 25x3mm size aluminium strip. For clamping the multicore cables, self-

locking, de-interlocking type fire-resistant nylon clamps/straps of sufficient strength shall be used.

5.09.00 Consumables and Hardware

5.09.01 The Bidder shall furnish all erection materials, hardware and consumables required to complete the installation.

5.09.02 The materials shall include but not be limited to the following :

Consumables : Welding rods & gas, oil and grease, cleaning fluids, paints, electrical tape, soldering materials etc.

Hardware : Bolts, nuts, washers, screws, brackets, supports, clamps, hangers, saddles, cleats, sills, shims etc.

5.09.03 Supply of cement, sand, stone etc. required for the execution of the contract shall be the responsibility of the Bidder.

5.10.00 Testing Equipment

5.10.01 The major testing equipment that are required to be arranged by the Bidder for site testing are listed below:

a) Insulation Tests

i) Power operated Meggar - 1 KV and 10 KV grade

ii) Hand operated Meggar - 1 KV grade

b) Hand driven earth Resistance Meggar, range 0-1/3/30 ohms.

c) High potential testing set - roller mounted type

d) Tong testers of suitable ranges.

e) Contact resistance measuring set for micro-ohms.

f) Torque wrench of various sizes.

g) Multi meters, test lamp, field telephone with buzzer set, different gauges etc.

5.10.02 The list of equipment is indicative only. Any other test equipments required shall be arranged by the Bidder.

6.00.00 METHODS AND WORKMANSHIP

6.01.00 All work shall be installed in a first class, neat workmanlike manner by mechanics/electricians skilled in the trade involved.

6.02.00 The erection work shall be supervised by competent supervisors holding relevant supervisory license from the Government.

6.03.00 All details on installation shall be electrically and mechanically correct.

- 6.04.00 The installation shall be carried out in such a manner as to preserve access to other equipment installed.
- 7.00.00 INSTALLATION**
- 7.01.01 Installation work shall be carried out in accordance with good engineering practices and also as per manufacturer's instructions/ recommendations where the same are available.
- 7.01.02 Equipment shall be installed in a neat workmanlike manner so that it is level, plumb, square and properly aligned and oriented.
- 7.01.03 Cable installation work shall mean erection of cable trays/racks, supports, hangers, junction boxes, conduits, laying of cables either in ground or on trays inside trenches tunnels/overhead trays in conduits etc. dressing and clamping, jointing and termination inclusive of supply of necessary jointing/termination kits, lugs, glands, ferrules, tapes etc. and other accessories, grounding of cable armour. In case of direct laying in ground, all excavation work, necessary back-filling, supply of bricks and protective concrete slabs, removal of excess earth shall be part of the installation work.
- 7.01.04 Grounding installation work shall mean erection, jointing/brazing/welding, connection and painting, testing of ground conductors including supply of necessary steel/copper.
- 7.01.05 Lightning protection system installation work shall mean erection, jointing, welding, connection and painting, testing of air termination network, down conductors, shielding masts, connection to ground grid, electrodes, risers, horizontal conductors etc. of lightning protection system.
- 7.02.00 Cable Trays**
- 7.02.01 Pre-fabricated cable trays and accessories shall be assembled & erected at site. Adequate spaces shall be provided to facilitate installation of cable system and to allow routine inspection and modification after installation.
- 7.02.02 Cable trays either inside concrete trenches or inside buildings and racks inside cable shafts shall be aligned and leveled properly. All tray runs shall be installed parallel to the trench/building walls and floors except otherwise noted in the approved drawings.
- 7.02.03 As far as practicable, cable trays shall be supported from one side only in order to facilitate installation and maintenance of cables from the other side.
- 7.02.04 The cable trays shall be supported in general at a span of not exceeding 1.5 metres horizontally and 1.0 metre vertically.
- 7.02.05 Sufficient spacing not less than 250 mm shall be provided between trays and maintained to permit adequate access, for installing & maintaining the cables..

- 7.02.06 Complete cable tray support structure after installation shall be inspected/ tested for welding strength, straightness, accuracy, use of proper sizes and compliance to drawings.
- 7.02.07 Complete cable tray and accessory installation work shall be inspected/tested for proper alignment, leveling, use of proper accessories, high quality workmanship etc.
- 7.02.08 The Bidder shall remove the RCC/steel trench covers whenever required and shall again place the same in their positions after the erection work in the particular area is completed or when further work is not likely to be taken up for some time.
- 7.02.09 Whenever any pipe/conduit/cable tray emerges out or enters into a building care should be taken to ensure that no water enters into the building.
- 7.02.10 Cable trays in areas subject to excessive coal dust, oil spillage, mechanical damage or accessible to personal contact shall be provided with raised sheet metal tray covers, installed on upper tray in horizontal run and front in vertical run.
- 7.02.11 Cable trays/racks shall be so arranged that they do not obstruct or impair clearances of passage way.
- 7.02.12 Cable tray/conduit system shall be so designed as to accommodate maximum pulling tension and minimum bending radius of cable.
- 7.02.13 Cable tray/conduit system shall be constructed to prevent drainage of water into equipment or building.
- 7.02.14 Cable tray/conduit system shall be electrically continuous and grounded.
- 7.02.15 Different voltage grade cables shall be laid in separate trays when trays are run in tier formation. Power cables shall normally be on top trays and control/instrumentation cable on bottom trays.
- 7.02.16 Trenches
- i) PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps.
 - ii) No subzero level cable vault/trenches shall be provided below control building/switchgear rooms in FGD areas.
- 7.03.00 **Cable and Conduits**
- 7.03.01 The Bidder shall install, terminate and connect up all cable and conduits as per drawings and cable schedules.

- 7.03.02 The drawings shall be strictly followed except where obvious interference occurs. In such cases, the routing shall be changed as directed and/or approved by the Engineer.
- 7.03.03 Approximate lengths of cable and conduit runs shall be shown by the Bidder in the cable schedule for guidance only. Before commencement of work the Bidder shall take actual measurements and prepare his own cable-cutting schedule to reduce wastage to a minimum.
- 7.03.04 The Bidder shall also maintain and submit when requested, a record of cable insulation value when drawn from store, after laying, before and after termination/jointing.
- 7.03.05 Where direct heat radiation exists, heat isolating barriers, shall be adopted for cabling system.
- 7.03.06 Cabling/wiring in offices, laboratories, control rooms etc. shall be taken through concealed G.I. or rigid PVC pipes as directed by the Owner's Engineer.
- 7.03.07 At certain places where hazardous fumes/gasses may cause fire to the cables, cable trenches after installation of cables shall be sand filled.
- 7.04.00 **Conduit and Accessories**
- 7.04.01 Conduit/pipes shall be used only in short lengths in certain areas where required and/or as directed by the Engineer.
- 7.04.02 The Bidder shall furnish all conduits complete with accessories as required.
- 7.04.03 Conduits shall be flexible type in general. However, rigid type steel conduit if required shall also be supplied by the Bidder.
- 7.04.04 Except for inside an enclosure wherever the cable enters or leaves the conduit, the conduit end shall be sealed by suitable sealing compound, having fire withstand capability.
- 7.04.05 The entire metallic conduit system, when embedded or exposed shall be electrically continuous and grounded.
- 7.04.06 Where it is possible for water or other liquids to enter conduits, sloping of conduit runs and drainage of flow points shall be considered.
- 7.04.07 Pull boxes shall be installed between termination points where required to facilitate cable pulling, but at a maximum interval of 30 meters.
- 7.04.08 Conduits shall be firmly fastened within 900 mm of each junction box/pull box/cabinet/fitting etc. Conduits shall be supported at least every 2000 mm.
- 7.05.00 **Cables: Storage and Handling**

- 7.05.01 Cable drums shall be stored on hard and well-drained surface so that they may not sink. In no case shall the drum be stored on the flat, i.e., with flange horizontal.
- 7.05.02 Rolling of drums shall be avoided as far as practicable, for short distance, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.
- 7.05.03 In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cable.
- 7.05.04 For unreeling the cable, the drum shall be mounted on jacks or on cable wheel. The spindle shall be strong enough to carry the weight without bending.
- 7.05.05 The drum shall be rolled on the spindle slowly so that the cable should come out over the drum and not below the drum.
- 7.05.06 While laying cable, cable rollers shall be used at an interval of 2000 mm. The cables shall be pushed over the roller by a gang of people positioned in between rollers over a suitable distance. Care shall be taken so that kinks and twists or any mechanical damage does not occur in cables. Only approved cable pulling grips or other devices shall be used. Cables shall not be dragged on ground or along structure while laying out from cable drums.
- 7.05.07 Cable shall not be pulled from the end without having intermediate pushing arrangement. Bending radius of the cable during installation shall not be less than what is specified by the manufacturer.
- 7.05.08 Empty cable drums shall be returned to the Owner.
- 7.06.00 **Cable Laying**
- 7.06.01 Cable shall generally be installed in ladder type prefabricated trays except for some short run in rigid/flexible conduit for protection or crossings.
- 7.06.02 Cables laid on trays and risers shall be neatly dressed and clamped with self-locking type fire resistant nylon ties at an interval of 750 mm for horizontal and vertical runs, in case of both power, control and instrumentation cables.
- 7.06.03 All single core power cables for 3 Ph. AC circuits shall be laid in trefoil formation and suitably clamped with self-locking type fire resistant nylon ties at an interval of 750mm.
- 7.06.04 L.T. multicore power cables with cross-sectional area of 95 sq.mm and above and all H.T. multicore power cables and shall be clamped individually by self-locking type fire resistant nylon ties.
- 7.06.05 L.T. power cables of cross sectional area less than 95 sq.mm and all control and Instrumentation cables shall be clamped in bunches with self-locking type fire resistant nylon ties. The number of cable in one bunch shall not exceed eight (8).

- 7.06.05 Prior to laying of cables inside the indoor and outdoor trenches, the Bidder shall properly clean the trenches.
- 7.06.06 In outdoor areas, buried cables shall be laid and covered with sand/riddled earth and protected from damage by bricks at sides and precast slab at top.
- 7.06.07 When buried cables cross road/railway track, adequate protection shall be provided in the form of hume/ galvanised iron pipes laid at a minimum depth of 1 meter below ground.
- 7.06.08 After completion of installation and prior to connection, all power cables shall be subjected to a high potential test.
- 7.07.00 **Cable Fire Sealing**
- 7.07.01 Cable/cable tray openings in walls and floors or through pipe sleeves from one area to another or from one elevation to another within the unit shall be sealed by a fire proof sealing system (FPSS) of minimum 2 Hrs rating. The FPSS shall effectively prevent the spread of fire from the flaming to non-flaming side of a fire.
- 7.07.02 Wherever the cables/cable trays pass through walls/floors, fire proof cable penetration seals rated for two hour shall be provided. This shall be by suitable block system using individual blocks with suitable framework or by silicon RTV foaming system. In case foaming system is offered, damming board, if used, shall not be considered for fire rating criteria. Any of the system offered shall be of proven type as per BS: 476 (Part-20) or equivalent standard.
- In order to prevent fire propagation through cable penetrations, after laying, dressing & clamping of cables, all the openings shall be properly sealed by using Fire Stop Mortar Seal and Fire Retardant Cable coating compound. Also the cable runs both before and after the fire scale shall be suitably sprayed with anti-fire propagation liquid.
- 7.08.00 **Cable Laying in Trenches**
- 7.08.01 RCC cable trenches with removable covers shall be provided by the Contractor. Cables shall be laid in 3 or 4 tiers in these trenches RCC covers of trenches in process area shall be effectively sealed to avoid ingress of chemicals etc. Removal of concrete covers for purposes of cable laying and reinstating them in their proper positions after the cables are laid shall be done by the Contractor at no extra cost.
- 7.08.02 For cable trays are laid in trench in more than two tiers a space of minimum 600 mm shall be available for maintenance. In case two or more tiers of cable trays are running parallel along both sides of trench walls there shall be space of minimum 600 mm between them.

- 7.08.03 Cables shall be handled carefully during installation to prevent mechanical injury to the cables. Ends of cable leaving trenches shall be coiled and provided with a protective pipe or cover till such times the final termination to the equipment is completed.
- 7.08.04 Prior to laying of cables inside both indoor and outdoor trenches, the Contractor shall properly clean inside of those trenches.
- 7.08.05 When cables are laid in multiple tiers, spacing between individual tiers shall be as approved by Site Engineer.
- 7.08.06 As each row of cables is laid in place every cable shall be given on insulation test in the presence of Site Engineer. Any cable, which proves defective, shall be replaced before the next groups of cables are laid.
- 7.08.07 All wall openings/pipe sleeves shall be effectively sealed after installation of cables to avoid seepage of water inside building/lined trench.
- 7.08.08 Where cables rise from trenches to motor, control station, lighting panels etc., they shall be taken in G.I. Pipes for mechanical protection up to a minimum of 150mm above grade.
- 7.08.09 Cable ends shall be carefully pulled through the conduit, to prevent damage to these cables. Where required, approved cable lubricant shall be used for this purpose. Where cable enters conduit the cable should be bent in large radius. Radius shall not be less than the recommended bending radius of the cables specified by the manufacturer.
- 7.08.10 Following guide of the pipe fill shall be used for sizing the pipe size:-
- a) 1 cable in pipe - 53% full
 - b) 2 cables in pipe - 51% full
 - c) 3 or more cables - 40% full
- 7.08.11 After the cables are installed and all testing is complete, conduit ends above grade shall be plugged with a suitable weatherproof plastic compound/'PUTTI' for sealing purpose. Alternatively G.I. Lids or PVC bushes shall be employed for sealing purposes. The cost for the same shall be deemed to have been included in the installation of G.I. pipe and no separate payment shall be allowed.
- 7.08.12 Where cables pass through foundation walls or other underground structures, the necessary ducts or openings shall be provided in advance for the same. However, should it become necessary to cut holes in existing foundations or structures, the electrical Contractor shall determine their location and obtain approval of the Site Engineer before cutting is done.
- 7.09.00 **Cable Tags & Markers**

- 7.09.01 Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedules. Cables and conduits shall be tagged at their entrance, bends, every 30.0M and exit from any equipment, junction box. When a cable/conduit passes through a wall, tags shall be fitted on both sides of the wall.
- 7.09.02 The tags shall be of aluminium with the number punched on it and securely attached to the cable by not less than two turns of 16 SWG G.I. wire. For single core cable the wire shall be of non-magnetic material.
- 7.09.03 Location of cable joints, if any, shall be clearly indicated with cable marker with an additional inscription 'cable-joint'.
- 7.09.04 Contractor shall furnish and install all tags and markers stated above.
- 7.09.05 For buried cable, the marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change of direction.
- 7.10.00 Cable Termination and Connection**
- 7.10.01 Termination and connection of cables shall be done strictly in accordance with manufacturer's instruction, drawings and/or as directed by the Engineer.
- 7.10.02 Work shall include all clamping, fitting, fixing, soldering, tapping, compound filling, cable jointing, crimping, shorting and grounding as required for the complete job. All equipment required for all such operations shall be of Contractor's procurement. Furnishing of all consumable materials such as soldering material, electrical tape, sealing material as well as cable jointing kits shall be included in the offer.
- 7.10.03 Cable joint kits for all cables shall be supplied by Contractor under this specification. Responsibility for proper termination shall lie on the contractor. Guarantee for termination shall also have to be given by Contractor.
- 7.10.04 The equipment will be generally provided with blank bottom plates for cable/conduit entry and cable end box for power cables.
- 7.10.05 The bidder shall perform all drilling, cutting on the blank plate and any minor modification work required to complete the job.
- 7.10.06 If the cable end box or terminal enclosure provided on the equipment is found unsuitable and requires major modification, the same shall be carried out by the contractor.
- 7.10.07 Control/instrumentation cable cores entering control panel/ switchgear/ MCC, etc. shall be neatly bunched and served with PVC perforated tape to keep it in position at the terminal block.
- 7.10.08 The bidder shall put ferrules on all control cable cores in all junction boxes and at all terminations. The ferrules shall carry terminal numbers as per drawings. All ferrules shall be coloured, plastic & interlocked type.

- 7.10.09 Spare cores shall be similarly ferruled, crimped with lug and taped on the ends. Spare cores shall be ferruled with individual cable number.
- 7.10.10 Termination and connection shall be carried out in such a manner as to avoid strain on the terminals.
- 7.10.11 All cable entry points shall be properly sealed and made vermin and dust proof. Unusual opening, if any, shall be effectively closed. Sealing work shall be carried out with approved sealing compound having fire withstand capability for at least three hours.
- 7.10.12 Strips and special tools like manually or pneumatically driven gun/pistol for termi point/equivalent connection shall be supplied by the Contractor.
- 7.11.00 **Cable Joints**
- 7.11.01 Cable shall be installed without joints as far as practicable.
- 7.11.02 If however jointing becomes necessary, it shall be made only by qualified cable joiner and strictly in accordance with manufacturer's recommendation.
- 7.12.00 **Grounding**
- 7.12.01 The Bidder shall carry out the interconnection among various peripheral earthing grids/mats, steel structures, lightning protection system as well as grounding of all electrical equipment, etc. The grounding work shall be carried out as per provisions of I.E. rules Indian standards and enclosed grounding and lightning protection notes and details.
- 7.12.02 Grounding shall be done by conductors of adequate sizes (size shall be selected by the bidder with supporting calculation, if not specified) and the same shall be connected to the risers of main ground mat.
- 7.12.03 For fabricated cable trays, a separate ground conductor (50x6 mm G.S. flat) shall run along the entire length of each route of cable tray being suitably clamped on the cable tray. Individual cable trays of each section shall be connected to above ground conductor through 50x6 mm G.S. flat to maintain continuity of ground path.
- 7.12.04 All ground conductor connections shall be made by electric arc welding/ brazing unless otherwise specified. Ground connections shall be made from nearest available station ground grid risers. The rods/connection shall be coated with cold galvanizing /weather resistance anti corrosive paints.
- 7.12.05 All ground conductors shall be painted black for easy identification.
- 7.12.06 Equipment ground connections, after being checked and tested by the Engineer, shall be coated with anti-corrosive paint.

7.17.02 Upon completion of work, the Bidder shall remove all rubbish, tools, scaffoldings, temporary structures and surplus materials etc. to leave the premises clean and fit for use.

8.00.00 TESTS

8.01.00 Shop Tests

8.01.01 All equipment shall be completely assembled, wired, adjusted and routine tested as per relevant Indian Standards at manufacturer's works.

8.01.02 Tests on panels/junction boxes shall include:

- a) Wiring continuity tests.
- b) High voltage and insulation tests.
- c) Operational tests.

8.02.00 Site Tests

8.02.01 Bidder shall thoroughly test and meggar all cables, wires and equipment to prove the same are free from ground and short circuit.

8.02.02 If any ground or short circuit is found, the fault shall be rectified or the cable and/or equipment replaced.

8.02.03 All power cables after installation and prior to connections shall be subjected to High Potential tests. Also the insulation resistance values shall be measured both before and after Hipot test for comparison. The leakage current shall also be measured during the Hipot test at site.

Cable cores shall be tested for:

- a) Physical damage
- b) Continuity
- c) Correctness of connections as per relevant wiring diagram
- d) Insulation resistance to earth
- e) Insulation resistance between conductors
- f) Proper earth connections of cable glands, cable boxes, cable armour, screens etc.

8.02.04 All equipment shall be demonstrated to operate in accordance with the requirements of this specification.

8.03.00 Test Certificates

8.03.01 Type test certificate on any equipment, if so desired by the Owner, shall be furnished. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

9.00.00 DRAWINGS, DATA & MANUALS

9.01.00 To be submitted with the Bid

9.01.01 Make, type and catalogue number of different electrical items and accessories along with technical leaflets, data sheets etc.

9.01.02 Typical General arrangement drawings showing constructional features, fixing arrangement of pre-fabricated cable trays.

9.01.03 Bill of Materials for cable trays and accessories, conduits & accessories.

9.01.04 Layout of Grounding system and lightning protection system showing connection and other details along with backup design calculations and detailed write up.

9.01.05 Bill of materials for grounding and lightning protection system.

9.01.06 Drawing showing details of equipment grounding.

9.02.00 To be submitted after Award of Contract

9.02.01 Make, type and catalogue number of cable termination kits, joints and accessories.

9.02.02 Detail dimensional drawings showing constructional features, grounding, fixing arrangement etc.

9.02.03 Bill of Materials for Pre-fabricated cable tray and accessories, Conduits & accessories.

9.02.04 Dimensional G.A. drawings and data sheets for different equipment and items supplied under this specification.

9.02.05 Layout drawing of Grounding system and Lightning protection system showing connection details along with backup design calculation and detailed write up.

9.02.06 Bill of material for grounding system and lightning protection system.

9.02.07 Drawing showing details of equipment grounding system.

**NOTES AND DETAILS
FOR
CABLING SYSTEM**

1.00.00 GENERAL

1.01.00 These notes and details shall be read and construed in conjunction with Specification and the drawings meant for cable tray details and supporting arrangements in Trench, Racks etc., enclosed elsewhere. In case of conflict between these notes and drawings, the latter shall prevail.

1.02.00 The Cabling System installation work shall conform to the requirements of the latest revisions of the following standards/codes

- a) Indian Electricity Rules, 1956, with up to date amendment.
- b) I.S. Code of Practice

2.00.00 CABLE ROUTING/LAYING

2.01.01 Cables shall generally be laid on ladder type cable trays either in trenches or overhead supported from building steel/structures except in some cases cables may have to be laid underground and for short runs in conduits for protection or crossing.

2.01.02 For interplant connections, the cables may be routed through an overhead cable bridge or cable trenches/tunnels selection being dependent on site constraints. Directly buried cable shall be avoided as far as possible. Owner's prior approval shall be taken for exceptional cases, where buried cables cannot be avoided.

2.01.03 For underground crossing of railways, roads etc. hume pipes shall be used and shall be laid at a depth of minimum 1000 mm such that cables shall not be damaged.

2.01.04 The cable racks in dust prone areas shall be supported from available structure in vertical configuration with suitable cover to avoid deposition of lignite dust as far as practicable.

2.01.05 Different voltage grade cables shall be laid in separate trays when trays are arranged in tiers. Power cables shall be on top trays and Control/Instrumentation cables on bottom trays, and it is recommended that trays for cables of different voltage levels be stacked in descending order with higher voltage level above.

2.01.06 Cables for redundant equipment/system shall be run in separate trays in separate route.

- 2.01.07 Cables from two different services viz. supply from station board and supply from unit board shall be fully segregated to prevent simultaneous damage due to fire in one of the services.
- 2.01.08 Low level signal cables and other special Instrumentation and Control cables shall run in separate trays. In general, a minimum of 1500 mm clearance shall be maintained between these cables and noise generating equipment (large motors, generators, transformers etc.).
- 2.01.09 The cable spreaders of each unit shall be compartmentalized by provision of fire proof partition wall.
- 2.01.10 The floor of the cable spreader rooms shall have to be made water proof so that water does not percolate to lower levels in the event of fire fighting operations. Adequate arrangement for efficient drainage of water shall be provided. The cable raceways should also be suitably curved to avoid water entry through this place.
- 2.02.00 **Cable Trays/Supports**
- 2.02.01 Cable trays and covers shall be pre-fabricated type, constructed from minimum 14 SWG sheet steel for trays and 16 SWG for covers and hot-dip galvanized after fabrication.
- 2.02.02 Cable tray supports shall be cantilever type for each installation. All supports and hardware shall be hot-dip galvanized. Support shall be fixed with bolts and no welding shall be done on the galvanized parts.
- 2.02.03 Standard cable tray width shall be 600 mm. However, trays with 450, and 300, 150 mm width may be used in some places considering the requirement and space restrictions. For instrumentation and control purpose, some perforated type cable trays of width 150 and/or 100mm may be used particularly in low space area and 600, 450, 300 mm perforated trays may be used depending on site requirement.
- 2.02.04 Cable trays shall be ladder type with 250 mm rung spacing, 100 mm depth and rung width not less than 50 mm.
- 2.02.05 All weld for cable tray supports shall have a minimum throat thickness of 6 mm.
- 2.02.06 Cable trays in areas subjected to excessive lignite dust, or mechanical damage shall have hot-dip galvanised sheet metal tray cover installed on front tray in vertical run and inverted 'V' type on upper tray in horizontal run.
- Where covers are used on trays containing power cables, consideration should be given to ventilation requirements. Areas where corrosive chemicals are likely to be handled, cable tray and covers shall be epoxy painted.
- 2.03.00 **Conduits**

- 2.03.01 Conduits shall be rigid steel coated type; minimum size of conduit shall be limited to 19mm.
- 2.03.02 Steel conduits with interior coating of silicon epoxy ester for ease of wire pulling shall be seamed by welding and flo-coat metal conduit/hot-dip galvanized. These shall be supplied in standard length of 5M with minimum wall thickness as specified in IS: 9537 Part-II. In chemical handling areas, Battery room etc., the exterior surface shall be further coated with chromate and polymer for better resistance to corrosion.
- 2.03.03 Conduit runs shall be supported at an interval of 750 mm for vertical run and 1000 mm for horizontal run.
- 2.03.04 Conduits shall be sized so that conduit fill (ratio of total cable area to conduit area) shall not exceed the following:
- | | | |
|-------------------|---|-----|
| One Cable | : | 53% |
| Two Cable | : | 31% |
| Three Cables & Up | : | 40% |
- 2.03.05 Conduit runs shall be provided with necessary bends as required.
- 2.04.00 **Installation**
- 2.04.01 The Bidder shall install, terminate and connect up all cables and conduits with supporting arrangements as per drawings, cable schedules and interconnection chart/drawings.
- 2.04.02 The HV power cables of 11 KV/3.3 KV shall be laid in trays or racks as follows:
- In single layer only.
 - 3 core cables to be laid giving one diameter gap of the largest diameter adjacent cable.
 - Single core cables to be laid in trefoil formation with a spacing equal to diameter of the trefoils.
- 2.04.03 1100V grade power cables shall be laid in single layer in trays.
- 2.04.04 1100V grade power cable shall be laid giving one diameter gap of the largest diameter adjacent cable.
- 2.04.05 Control and Instrumentation cables can be laid up to a maximum of three layers in each tray.
- 2.04.06 The trays shall be run with a vertical spacing of 300 mm for overhead cable trays as well as inside cable trenches. A minimum of 225 mm clearance shall be provided between the top of tray and beams, cold piping, 500 mm clearance for hot piping/object to facilitate installation of cables in tray.

- 2.04.07 Adequate pull boxes shall be provided in conduit run to facilitate cable pulling in long runs and also to ensure that there shall be no more than 270 Deg. bends between pull points.
- 2.04.08 Cable tray/conduit system shall be installed to accommodate cable manufacturer's recommended maximum pulling tension and minimum bending radius.
- 2.04.09 All openings in the floor and wall for cable access shall be sealed after installation of the cable system with non-inflammable materials, as follows:
- i) Fire stop/Penetration seal shall be installed in the cable spreaders and cable raceways.
 - ii) Similarly in the trenches fire stop/penetration seals shall be provided at suitable interval to avoid spread of fire.
 - iii) For all H.V., L.V., Relay and Control panels, Control desk, instrumentation panels, battery charger, D.C. Dist. boards and other miscellaneous panels, fire-stops should be provided below base plate.
- 2.04.10 All floor/wall openings for cable entry to the electrical equipment and accessories shall be sealed with non-inflammable materials, after completion of cable installation. Thickness of such materials shall be equal to the thickness of floor/wall unless specified otherwise.
- 2.04.11 The portion of galvanized steel, which, if required, undergoes any welding at site shall be coated with two (2) coats of cold galvanizing anti-corrosive paint after welding.
- 2.04.12 The cables shall be coated with fire protection coating as specified elsewhere.
- 2.05.00 **Identification**
- 2.05.01 The complete cabling system shall be properly identified. Methods for identification of cabling system shall be furnished to the successful tenderer and the Bidder shall strictly adhere to the said methods.
- 2.05.02 Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule.
- 2.05.03 Location of cables laid directly underground shall be clearly indicated with cable marker made of galvanized iron plate, projected above ground level.
- 2.05.04 Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, at each bend and at every thirty (30) metres in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, MCC, control & relay panels etc. wherever required for cable identification, such as where a number of cables enter together through a gland plate.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO.:	DATE:
	CUSTOMER :				QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
	PROJECT:				PO NO.:	DATE:
	ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))		SYSTEM:		SECTION: II	SHEET 1 of 2

S. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	**	
					M C/ N			D	M C N	
		1.WORKMANSHIP	MA	VISUAL	100%	MFG. SPEC.	MFG. SPEC.	LOG BOOK	P -	-
		2.DIMENSIONS	MA	VISUAL	100%	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK	P -	-
1.0	ASSEMBLY	3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./	MFG.SPEC.	LOG BOOK	P -	-
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓ P V	-
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓ P V *	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓ P V *	* NOTE -1 & NOTE-2

BHEL				BIDDER/SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Sign & Date		Doc No:		Sign & Date	
Prepared by:	HEMA KUSHWAHA	Checked by:	KUNAL GANDHI	Sign	Date	Sign	Date	Reviewed by:	Name	Seal	
Reviewed by:	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	Sign	Date	Sign	Date	Approved by:			

	MANUFACTURER/ SUPPLIER NAME & ADDRESS		BIDDER/ ADDRESS		STANDARD QUALITY PLAN			SPEC. NO.:	DATE:
	CUSTOMER :				QP NO.: PE-QP-999-Q-006, REV-02			DATE: 17.04.2020	
	PROJECT:				PO NO.:			DATE:	
	ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))		SYSTEM:		SECTION: II			SHEET 2 of 2	

		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#).	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-
(#)													

NOTES:

1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

*RECORDS, IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

** M: SUPPLIER/MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, C: CUSTOMER,

P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE

MA: MAJOR, MI: MINOR, CR: CRITICAL

D: DOCUMENTATION

BHEL				BIDDER/SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Sign & Date		Doc No:		Sign & Date	
Prepared by:	HEMA KUSHWAHA	Checked by:	KUNAL GANDHI	Sign	Date	Sign	Date	Reviewed by:	Name	Seal	
Reviewed by:	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	Reviewed by:		Reviewed by:		Approved by:			

 MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO.
	CUSTOMER :		QF NO.: PE-QP-999-Q-007, REV/04
	PROJECT:		PO NO.:
	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II
			SHEET 1 OF 9

SI No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	+	=			
					M	C/N				D	M	C	N	
1.0	RAW MATERIAL & BOUGHT CUT CONTROL													
1.1	SHEET STEEL PLATES, SECTION EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	-	LOG BOOK BLINKS, CRACKS, WARRINESS ETC	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	MEASUREMNT	SAMPLE	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	LOG BOOK		P	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	SAMPLE	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TEST REPORT		P/V	-	-	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%	-	-	FREE FROM CRACKS, UN- EVENNESS ETC,	TEST REPORT		P	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TC		P/V	-	-	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%	-	MANUFACTURER'S DRG./SPEC	FREE FROM CRACKS, BLOW HOLES ETC,	LOG BOOK		P/V	-	-	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TC		P/V	-	-	HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMNT	100%	-	MANUFACTURER'S DRG.	MANUFACTURER'S DRG.	LOG BOOK		P/V	-	-	
1.4	PAINIT & VARNISH	1.MAKE SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	LOG BOOK		P/V	-	-	

BHEL				
ENGINEERING			QUALITY	
	Sign & Date	Name	Sign & Date	Name
Prepared by:	HEMA KUSHWAHA Asst. Engrg. (Mechanical) BHEL, Warangal	HEMA KHUSHWAHA	Checked by:	KUNAL GANDHI Asst. Engrg. (Mechanical) BHEL, Warangal
Reviewed by:	PRAVEEN Asst. Engrg. (Mechanical) BHEL, Warangal	PRAVEEN DUTTA Asst. Engrg. (Mechanical) BHEL, Warangal	Reviewed by:	R K JAISWAL Asst. Engrg. (Mechanical) BHEL, Warangal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:		Sign & Date	Seal
Reviewed by:			
Approved by:			

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS				STANDARD QUALITY PLAN				SPEC. NO.	
CUSTOMER : PROJECT: ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))						QP NO.: PE-QP-999-Q-007, REV-04				DATE:17.04.2020	
						PO NO.:					
						SECTION: II				SHEET 2 OF 9	
SI No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check	Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY		
1		3	4	5	6	7	8	9	+	-	
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND. 2. CHEM. & PHYSICAL PROPERTIES 3. DIMENSIONS	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	LOG BOOK	D	M	N
			MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MANUFACTURER'S DRG/ SPEC.	MANUFACTURER'S DRG/ STD.	TC		P/V	-
			MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG/ SPEC.	LOG BOOK		P/V	-
		4.INTERNAL FLAWS	CR	ULTRASONIC TEST	100%	-	ASTM-A388	INSPECTION REPORT	✓	P/W	V
1.6	SPACE HEATERS, CONNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	100%	-	MANUFACTURER'S DRG./STD.	INSPECTION REPORT		P/V	-
		2. PHYSICAL COND.	MA	VISUAL	100%	-	MANUFACTURER'S DRG./STD.	INSPECTION REPORT		P/V	-
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG./ STD.	INSPECTION REPORT		P/V	-
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-	MANUFACTURER'S DRG./ STD.	TEST REPORT		P/V	-

FOR CUSTOMER REVIEW & APPROVAL		
Doc No:	Sign & Date	Seal
Reviewed by:		
Approved by:		

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

ENGINEERING		QUALITY	
Sign & Date	Name	Sign & Date	Name
Prepared by: HEMA KUSHWAHA	HEMA KHUSHWAHA	Checked by: 	KUNAL GANDHI
Reviewed by: PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by: R K JAISWAL	R K JAISWAL

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO. :		DATE:17.04.2020	
			CUSTOMER :		QP NO.: PE-QP-699-3-007, REV-04			
			PROJECT:		PO NO.:			
			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))		SYSTEM: II			
						SECTION: II		SHEET 3 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY		
1			4	5	6		7	8	9	D	M	N
					M	C/N						
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC. 2. DIMENSION (BORE DIA, WALL THICKNESS, BDV AS RECEIVED, BDV AFTER FOLDING AT 180°)	MA	VISUAL	100%	-	-	NO VISUAL DEFECTS	TEST REPORT	P/V	-	-
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND. 2. DIMENSIONS INCLUDING BURS HEIGHT 3. ACCEPTANCE TESTS	MA	TEST	SAMPLE	-	MANUFACTURER'S STD.	MANUFACTURER'S STD.	LOG BOOK AND/OR SUPPLIER'S TC	P/V	-	-
1.9	CONDUCTORS	1. SURFACE FINISH 2. ELECT. PROP. & MECH. PROP	MA	VISUAL	100%	-	-	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK	P	-	-
				MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG.	MANUFACTURER'S DRG.	LOG BOOK	P/V	-	-
				ELECT. & MECH TESTS	SAMPLE	-	MANUFACTURER'S DRG./ STD.	MANUFACTURER'S DRG./ STD.	TC	P/V	-	-
				VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK	*P/V	-	-
				ELECT. & MECH. TEST	SAMPLES	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S / SPEC.	TC & VENDOR'S TEST REPORTS	P/V	-	-

BHEL				QUALITY			
ENGINEERING							
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	Sign & Date
HEMA KUSHWAHA		HEMA KHUSHWAHA	PRAVEEN DUTTA		KUNAL GANDHI		
Reviewed by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	Sign & Date
DUTTA					R K JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS				STANDARD QUALITY PLAN				SPEC. NO. :	
					CUSTOMER :				QP NO.: PE-QP-999-Q-007, REV-04	
					PROJECT:				PO NO.:	
					ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))				SYSTEM: II	
									DATE:17.04.2020	
									SHEET 4 OF 9	

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY					
1	2	3	4	5	6		7	8	9	*	**	D	M	C	N	
					M	C/N										
1.10	BEARINGS	3.DIMENSIONS	MA	MEASUREMENT	SAMPLES	-	MANUFACTURER'S DRG/ SPEC.	MANUFACTURER'S / SPEC.	LOG BOOK	LOG BOOK	P/V	-	-	-	-	
		1.MAKE & TYPE	MA	VISUAL	100%	-	MANUFACTURER'S DRG/ APPROVED DATASHEET	MANUFACTURER'S DRG./ APPROVED DATASHEET	P/V	-	-	-	-	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	APPROVED DATASHEET	APPROVED DATASHEET/ DRAWING MANUF'S CATALOGUES	P/V	-	-	-	-	-	-	
		3.SURFACE FINISH	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK	P/V	-	-	-	-	-	-
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK	P	-	-	-	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	P	-	-	-	-	-	-	
		3.TEMP.WITH- STAND CAPACITY	MA	ELECT.TEST	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	P/V	-	-	-	-	-	-	
		4.HVIR	MA	-O-O-	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	P/V	-	-	-	-	-	-	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	-	MANUFACTURER'S DRG/SPECS	MANUFACTURER'S DRG/ SPECS.	P	-	-	-	-	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK	P	-	-	-	-	-	-
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	P	-	-	-	-	-	-	

ENGINEERING				BHEL				QUALITY			
Sign & Date		Name		Sign & Date		Name					
Prepared by: HEMA KUSHWAHA		Checked by: HEMA KHUSHWAHA		Sign & Date		Name					
Reviewed by: PRAVEEN DUTTA		Reviewed by: PRAVEEN DUTTA		Sign & Date		Name					
				Seal							
				Seal							
				Seal							

FOR CUSTOMER REVIEW & APPROVAL							
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Reviewed by:		Sign & Date		Name		Seal	
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	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS				STANDARD QUALITY PLAN				SPEC. NO. :	
					CUSTOMER :				QP NO.: PE-QIP-999-Q-007, REV-04	
					PROJECT:				PO NO.:	
					ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))				SYSTEM:	
									SECTION: II	
									DATE:17.04.2020	
									SHEET 5 OF 9	

SJ No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check			Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY			
1	2	3	4	5	6			7	8	9	10			
					M	C/N					D	M	C	N
2.0	IN PROCESS STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNESS 2.DIMENSIONS	MA	VISUAL	100%	-	MANUFACTURER'S DRG	GOOD FINISH	LOG BOOK	PW	-	-		
2.1			MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK	P	-	-		
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-	-DO-	GOOD FINISH	LOG BOOK	P	-	-		
		2.DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK	P	-	-		
2.3	PAINTING	3.SHAFT SURFACE FLOWS	MA	PT	100%	-	MANUFACTURER'S STD./ASTM E165	MANUFACTURER'S STD./APPROVED DATASHEET.	LOG BOOK	P	V	-		
		1.SURFACE PREPARATION	MA	VISUAL	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK	P	-	-		
		2.PAINT THICKNESS (PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK	P	-	-		
		3.SHADE	MA	VISUAL	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK	P	-	-		
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK	P	-	-		

ENGINEERING				BHEL				QUALITY			
Sign & Date		Name		Sign & Date		Name		Sign & Date		Name	
Prepared by: HEMA KUSHWAHA		HEMA KHUSHWAHA		Checked by: 		KUNAL GANDHI		Sign & Date		Seal	
Reviewed by: PRAVEEN DUTTA		PRAVEEN DUTTA		Reviewed by: RITESH KUMAR JAISWAL		R K JAISWAL		Reviewed by:			
DUTTA								Approved by:			

FOR CUSTOMER REVIEW & APPROVAL

Doc No:

Sign & Date

Sign & Date

Reviewed by:

Reviewed by:

Approved by:

Approved by:

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS				STANDARD QUALITY PLAN			SPEC. NO. :			
					CUSTOMER :			QP NO.: PE-QP-989-Q-007, REV/04			
					PROJECT:			PO NO.:			
					ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))			SYSTEM: II			
								SECTION: II		SHEET 6 OF 9	

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY			
1	2	3	4	5	6		7	8	9	10	11	12	13
					M	C/N							
2.4	SHEET STACKING	1.COMPLETENESS 2.COMPRESSION & TIGHTENING	MA	MEASUREMENT MEASUREMENT	-	-	MANUFACTURER'S STD. MANUFACTURER'S STD.	MANUFACTURER'S STD. MANUFACTURER'S STD.	LOG BOOK LOG BOOK		P	-	-
2.5	WINDING	1.COMPLETENESS 2.CLEANLINESS 3.IR+V+R 4.RESISTANCE 5.INTERTURN INSULATION	CR	VISUAL VISUAL ELECT. TEST ELECT. TEST ELECT. TEST	-	-	MANUFACTURER'S STD/APPROVED DATASHEET MANUFACTURER'S STD/APPROVED DATASHEET IS-325/IS-12615/IEC-60034 PART-1 IS-325/IS-12615/IEC-60034 PART-1 IS-325/IS-12615/IEC-60034 PART-1	MANUFACTURER'S STD/APPROVED DATASHEET MANUFACTURER'S STD/APPROVED DATASHEET IS-325/IS-12615/IEC-60034 PART-1 IS-325/IS-12615/IEC-60034 PART-1 IS-325/IS-12615/IEC-60034 PART-1	LOG BOOK LOG BOOK TEST/INSPC. REPORT TEST/INSPC. REPORT TEST/INSPC. REPORT		P	-	-
2.6	IMPREGNATION	1.VISCOSITY 2.TEMP. PRESSURE VACUUM 3.NO. OF DIPS	MA	PHY. TEST PROCESS CHECK PROCESS CHECK	-	-	MANUFACTURER'S STANDARD MANUFACTURER'S STANDARD MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD MANUFACTURER'S STANDARD MANUFACTURER'S STANDARD	LOG BOOK LOG BOOK LOG BOOK		P	-	-
													THREE DIPS TO BE GIVEN

ENGINEERING				BHEL				QUALITY			
Sign & Date		Name		Sign & Date		Name		Sign & Date		Name	
Prepared by: HEMA KUSHWAHA		HEMA KHUSHWAHA		Checked by: RITESH KUMAR		KUNAL GANDHI		Reviewed by: PRAVEEN DUTTA		R K JAISWAL	
DUTTA				JASWAL							

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN			SPEC. NO. :	
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							DATE:17.04.2020	
							SHEET 7 OF 9	

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY	
					M	C/N			D	**	M	C
1		3	4	5	6		7	8	9			
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION 1.COMPACTNESS & CLEANINESS 1.COMPLETENESS 2.SOUNDNESS	MA	PROCESS CHECK VISUAL	CONTINUOUS	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK	✓	P	V
			MA	VISUAL	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-
			CR	VISUAL	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-
			CR	MALLET TEST & UT	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	TEST/INSPC. REPORT	✓	P	V
2.9	COMPLETE ROTOR ASSEMBLY	3.HV 1.RESIDUAL UNBALANCE 2.SOUNDNESS	MA	ELECT. TEST	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	TEST/INSPC. REPORT	✓	P	V
			CR	DYN.BALANCE	100%	-	MANUFACTURER'S SPEC./ ISO 1840	MANUFACTURER'S DWG.	LOG BOOK		P	-
			CR	ELECT. OVERHEATER TEST	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	TEST/INSPC. REPORT	✓	P	V
			MA	MEAS.	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-
2.10	ASSEMBLY	1.ALIGNMENT 2.WORKMANSHIP 3.AXIAL PLAY 4.DIMENSIONS	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-
			MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-
			MA	MEAS.	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK	✓	P	V
			MA	MEAS.	100%	-	MANUFACTURER'S DRG./ MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-
		5.CORRECTNESS, COMPLETENESS, TERMINATIONS/ WORKMANSHIP, COLOUR CODE 6. RTD, 8TD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-
			MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK	✓	P	V

BHEL			
ENGINEERING		QUALITY	
Sign & Date	Name	Sign & Date	Name
HEMA KUSHWAHA	HEMA KHUSHWAHA		KUNAL GANDHI
Prepared by:		Checked by:	
Reviewed by: PRAVEEN	PRAVEEN DUTTA	Reviewed by:	R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN				SPEC. NO. :		
				CUSTOMER :				QP NO.: PE-QP-999-Q-007, REV-04		
				PROJECT:				PO NO.:		
				ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))				SYSTEM: II		
					SECTION: II				SHEET 8 OF 9	

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY		
1			4	5	6		7	8	9	*	D	M	C N
					M	C/N							
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS	MA	ELECT.TEST	1/TYPE/SIZE	1/TYPE/SIZE	IS-225/IS-12615/APPROVED DATASHEET	IS-325/IS-12615/APPROVED DATASHEET	TEST REPORT	✓	P	W*	-
		2.ROUTINE TESTS INCLUDING SPECIAL TEST	MA	ELECT.TEST	100%	-	IS-325/IS-12615/APPROVED DATASHEET	IS-325/IS-12615/APPROVED DATASHEET	TEST REPORT	✓	P	V [§]	-
		3.VIBRATION & NOISE LEVEL	MA	ELECT.TEST	100%	-	IS: 12075 /IEC 60034-14 & IS-12065	IS: 12075 /IEC 60034-14 & IS-12065	TEST REPORT	✓	P	V [§]	-
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET &	TEST/INSPC. REPORT	✓	P	W	-
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	-	IEC 60034-5/IS-12615	APPROVED DATASHEET	TC	✓	P	V	-
		6. MEASUREMENT OF RESISTANCE OF RTD & RTD	MA	ELECT. & MECH. TEST	100%	-	IS-325/IS-12615/IEC-60034 PART-1/IS-12602	IS-325/IS-12615/IEC-40034 PART-1/IS-12602	TC	✓	P	V [§]	-
		7. MEASUREMENT OF RESISTANCE I/R OF SPACE HEATER	MA	ELECT. & MECH. TEST	100%	-	IS-325/IS-12615/IEC-60034 PART-1	IS-325/IS-12615/IEC-60034 PART-1	TC	✓	P	V [§]	-
		8. NAME PLATE DETAILS	MA	VISUAL	100%	-	IS-325/IS-12615& DATA SHEET	IS-325/IS-12615 & DATA SHEET	TEST/INSPC. REPORT	✓	P	V [§]	-
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	-	IS 2148 /IEC 60079-1	IS 2148 /IEC 60079-1	TC	✓	P	V	-
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	SAMPLE	APPROVED DATASHEET	APPROVED DATASHEET	TC	✓	P	W [§]	-

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL					
ENGINEERING		QUALITY		Sign & Date		Sign & Date		Doc No:		Sign & Date		Seal	
Prepared by:	HEMA KUSHWAHA	Name		Sign & Date		Name		Reviewed by:		Sign & Date		Seal	
Reviewed by:	PRAVEEN DUTTA	Checked by:	HEMA KHUSHWAHA	Reviewed by:	R K JAISWAL	Checked by:	KUNAL GANDHI	Approved by:		Approved by:			

ANNEXURE-I : FORMAT OF QUALITY ASSURANCE PROGRAMME										
Name of Company/ Successful Bidder	NAME OF CONTRACT PACKAGE			QUALITY PLAN FOR						
	Package No. : _____ Bidderr : _____			QP No. : _____ Date _____ Rev.No.: _____ Date _____						
Sl. No.	Component & Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norm	Format of Record	Agency	Remarks

<u>ANNEXURE-II: MANUFACTURING QUALITY PLAN</u>										
MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN						PROJECT : PACKAGE : CONTRACT NO. : MAIN-SUPPLIER :		
MFGR.'s LOGO		ITEM :	QP NO.: REV. NO.: DATE: PAGE: OF							
		SUB-SYSTEM:								
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C L 	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9. D*	10.	11.
						LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) WILL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: SUPPLIER/NOMINATED INSPECTION AGENCY, L: PURCHASER P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: PURCHASER WILL IDENTIFIED IN COLUMN "N"		DOC. NO.: CAT.....		REV.....
MANUFACTURER/ SUB-SUPPLIER		MAIN-SUPPLIER				FOR PURCHASE R USE				
SIGNATURE								REVIEWED BY		APPROVED BY
										SEAL

335707/2021/PS-PEM-MAX :



**ELECTRICAL EQUIPMENT SPECIFICATION
FOR
ELEVATOR**

2x500 MW NLC Tamil Nadu Power Ltd.

SPECIFICATION NO.

VOLUME NO. : **II-B**

SECTION :

REV NO. **00** : DATE : 17.06.2021

SHEET : 1 OF 1

DATASHEET-A

ANNEXURE-I

- | | | | |
|------|--|--|--|
| 1.0 | Design ambient temperature | : | 50 °C |
| 2.0 | Maximum acceptable kW rating of LV motor | : | 160 KW * |
| 3.0 | Installation (Indoors/ Outdoors) | : | As required |
| 4.0 | Details of supply system | | |
| | a) | Rated voltage (with variation) | : 415V ± 10% |
| | b) | Rated frequency (with variation) | : 50 Hz + 5 % to - 5% |
| | c) | Combined voltage & freq. variation | : 10% (sum of absolute values) |
| | d) | System fault level at rated voltage | : 50 kA for 1 sec |
| | e) | Short time rating for terminal boxes | |
| | | o Above 90 kW (Breaker Controlled) | : 50 KA for 0.25 sec. |
| | | o 90 kW and below (Contactor Controlled) | : 50 KA protected by HRC fuse |
| | f) | LV System grounding | : Solidly |
| 5.0 | Winding & Insulation | : | Class F with temp rise limited to class B |
| 6.0 | Minimum voltage for starting
(As percentage of rated voltage) | : | 80% |
| 7.0 | Power cables data | : | Shall be given during detailed engg. |
| 8.0 | Earth Conductor Size & Material | : | Shall be given during detailed engg. |
| 9.0 | Space heater supply (for motors >=30kw) | : | 240 V, 1ϕ, 50 Hz |
| 10.0 | Rating up to which Single phase motor | : | Acceptable below 0.2 kW |
| 11.0 | Locked rotor current | | |
| | a) | Limit as percentage of FLC | : As per IS 12615 |
| 12.0 | Makes | : | BHEL/ Customer approval (Package owner to take care) |
| 13.0 | Paint shade | : | Blue (RAL 5015) – Corrosion proof |
| 14.0 | Degree Of protection for motor/ terminal box | : | Degree of protection for various enclosures as per IEC60034-05 shall be as follows:- |
| | i) Indoor motors - IP 23 | | |
| | ii) Outdoor motors - IP 55 | | |
| | iii) Cable box-indoor area - IP 23 | | |
| | iv) Cable Box-Outdoor area - IP 55 | | |

*** LT motors of continuous duty shall be energy efficient IE3 class conforming to IS-12615**

15.0 TESTING REQUIREMENTS: IN LINE WITH SPECIFICATION

335707/2021/PS-PEM-MAX

	TITLE MOTORS DATA SHEET – C 2x500 MW NLC Tamil Nadu Power Ltd.	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE 17.06.2021
		SHEET 1 OF 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

335707/2021/PS-PEM-MAX

	TITLE MOTORS DATA SHEET – C 2x500 MW NLC Tamil Nadu Power Ltd.	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE 17.06.2021
		SHEET 2 OF 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONT ROL CODE	REMA RKS No.	LOAD	VERIFICATI ON FROM MOTOR DATASHEE T (Y/N)	KKS NO	
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	Nos							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
ANNEXURE-II																					
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER																					
2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V																					
: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)																					
	PROJECT TITLE	2x500 MW NLC Tamil Nadu Power Ltd.										NAME	DATA FILLED UP ON								
	SYSTEM	ELEVATOR										SIGN.	DATA ENTERED ON								
	DEPTT. / SECTION	MAUX										SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE							

335707/2021/PS-PEM-MAX

PEM-6666-0



TITLE

**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPECIFICATION NO. PE – TS – 483 - 502 – A001

VOLUME II B

SECTION IC

REV 0 DATE JUNE-2021

SHEET OF

**SECTION – IC
DATA SHEET A**

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR	SPEC. NO. PE-TS-483-502-A001	
		VOLUME IIB	
		SECTION IC	SUB-SECTION
		REV. 00	DATE: JUNE-2021
		SHEET 1 OF 4	

S. No.	DESCRIPTION	PASSENGER ELEVATOR
1.	Elevator	FGD CONTROL BUILDING
2.	Type of Service	As per cl. no. 2.0.1 of section- IA Page no. 2 of 13
3.	Rated Load on Elevator	
4.	Quantity	
5.	Rated Speed of Lift	
6.	Total Travel	
7.	Nos. of floors to be served	
8.	Method of control.	ACVVVF Control with automatic level adjustment.
9.	Position of Machine Room	Directly above the lift Shaft.
10.	Car enclosure construction, design and finish car.	SS -304, min 1.5 mm thick. Sheet.
11.	Design, construction, installation codes including car size, door size, Shaft size, Size of platform and car entrance.	As per IS: 14665 (all parts), latest edition
12.	Car and landing door	Protected by central opening sliding stainless steel door (Horizontal bi-parting door).
13.	Car Flooring	PVC
	Car roof	Car roof shall be covered with sheet metal and shall be provided with LED light fitting & a three pin plug 5/15A, socket with switch on top of lift car.
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 LED light fittings on car roof. Lux level: 100 min. LED lighting with a 5A socket shall be provided at every 3 meters' interval in lift well/ hoist way. Light and fan in the Car enclosure shall be separate switch control.
18.	Power supply: a) Power b) Lighting & fan	415 Volts, (+/- 10% variation), 3 Phase, 50 Hz (+3% to -5% variation), combined voltage variation 10%, 4 wire system,

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR		SPEC. NO. PE-TS-483-502-A001	
			VOLUME IIB	
			SECTION IC	SUB-SECTION
			REV. 00	DATE: JUNE-2021
			SHEET 2 OF 4	
		240 Volts, 1 Phase, 50 c/s.		
19.	Other requirements	Internal telephone wiring and telephone hand set to be provided. The external connection shall be provided by Customer. Also, automatic rescue device shall be provided.		
20.	Additional requirements :-			
a)	Isolating cushion between car and car frame shall be provided.	Type of cushion shall be rubber pad or spring which shall be as per manufacturer's standard.		
b)	Three pin plug with socket on car top	5/15A, 3 pin plug socket with switch on top of lift car and inside shaft to take care maintenance requirement.		
c)	Car frame Material and type of construction	Steel and bolted construction		
d)	Landing Door	Fire rated for min. 2 hours.		
e)	Type of operation	- Automatic. - The door of car and landing shall be interlocked in such a way opening and closing of two doors shall be simultaneous and the doors will open when the lift is in lading zone.		
f)	Door hanger tracks along with accessories shall be provided.	Required		
g)	Safety shoes complete with accessories shall be provided.	Yes		
h)	Safety device for door operation shall be provided.	Full length Infrared light curtain along with pressure limiter as an extra mechanical safety is required.		
i)	Handrails on three sides of car	Mirror finish stainless steel		
j)	False ceiling	SS 304.		
k)	Emergency stop switch	Yes.		
l)	Braille switch	Yes.		
21.	Control and operation			
	(a)Type of control	Simplex / duplex		
	(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	Yes (To be provided by supplier)		

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR		SPEC. NO. PE-TS-483-502-A001	
			VOLUME IIB	
			SECTION IC	SUB-SECTION
			REV. 00	DATE: JUNE-2021
			SHEET 3 OF 4	
	per IS 14665			
26.	Emergency Light	Required.		
27.	Terminal buffers, their types and number of buffers	Spring buffers shall be Provided as per IS 14665.		
28.	Load plate	As per manufacturer's standard / as applicable		
29.	Counter weights frame	Fabricated Steel Construction		
30.	Counter weight fillers	Cast Iron		
31.	Number of Limit Switches	As per requirement		
	a) Location	Bottom & top terminal		
	b) Type	Electromechanical		
	c) Operation	Cam Operated		
32.	Controller and type	Selective Collective Controller with variable voltage variable frequency drive and Microprocessor based software controlled logic system		
33.	Reverse phase relay and other protective devices	Required		
34.	Car Safety & Governor			
	a) Stopping distance	As per IS:14665		
	b) Type and mode of operation of Over speed Governor device	Centrifugal action		
	c) Tripping speed and design code conforming to	As per IS 14665 (latest addition).		
	d) Location	At machine room.		
35.	Motor details			
	(a) Type	3 phase AC squirrel Cage Induction motor		
	(b) Type of Duty	Lift Duty		
	(c) Motor Duty	S4 /S5		
	(d) Duty Cycle of Motor	60%		
	(e) Applicable standard	IS:325		
	f) No. Of Starts Per Hour	Elevator Motor shall be suitable for minimum of 150 Starts per hour.		
	g) Direction of rotation	Both Clockwise & Anticlockwise		
	h) Class of Insulation	F, temp rise limited to class B. Motor shall be provided with thermal class 130 (B) or better insulation.		
	i) Method of Starting	AC Variable Voltage Variable Frequency Drive		
36.	Door Motor			
	a) Equipment driven by Motor	Door		
	b) Direction of rotation	Both Clockwise & Anticlockwise		
	c) Type of enclosures	IP54		

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR	SPEC. NO. PE-TS-483-502-A001	
		VOLUME IIB	
		SECTION IC	SUB-SECTION
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37.	Metallic Wire Mesh between Car & Counter Weight	Required
38.	Fire Man Switch	Required
39.	Sound Reducing Material	Isolation Rubber / other arrangement in the Machine shall be provided
40.	Automatic Rescue Device (Battery Drive)	Provided
41.	Trailing cables	FRLS type.
42.	Design seismic coefficient (an additional information for elevator building only)	According to IS 1893 - 1977
43.	Split Air condition in machine room	As per Machine room area (not less than 2T Capacity).
44.	1/2 Kg CO2/suitable type Fire extinguisher with fixing arrangement.	Provided.

TITLE

TECHNICAL SPECIFICATION FOR ELEVATOR

SPECIFICATION NO. PE – TS – 483 - 502 – A001

VOLUME II B

SECTION IIA

REV	0	DATE	JUNE-2021
-----	---	------	-----------

SHEET OF

SECTION –IIA

STANDARD TECHNICAL REQUIREMENT (ELECTRICAL)



TITLE

TECHNICAL SPECIFICATION of VVVF Drive

Elevator

SPEC. NO. PE-TS-483-502-A001

for VOLUME II - B

SECTION - IIA

DATE JUNE-2021

SUB SECTION

SHEET

1 OF 5

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.



TITLE

TECHNICAL SPECIFICATION of VVVF Drive Elevator

SPEC. NO. PE-TS-483-502-A001

for VOLUME II - B

SECTION - IIA

DATE JUNE-2021

SUB SECTION

SHEET

2 OF 5

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

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

2.0 Basic requirements for the AC Drives

2.1 General requirements

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

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

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

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

Rated Input Voltages	380V to 480V (-10% to +10% variation), three-phase
Rated Input Frequency	50Hz +3 % to - 5%
Output Voltage	0 – Input voltage, three-phase
Output Frequency Range	0 to 400 Hz
Acceleration / Deceleration Time	0.01 – 999s, adjustable, linear, with S, with U or customised shapes
Overload capability (Constant Torque)	150% of nominal current for 1min.
Operating ambient Temperature	-10°C up to 50°C (shall be de-rated suitably if not rated at 50°C)
Storage ambient Temperature	-25°C up to 70 °C



TITLE

TECHNICAL SPECIFICATION of VVVF Drive **Elevator**

SPEC. NO. PE-TS-483-502-A001

for VOLUME II - B

SECTION - IIA

DATE JUNE-2021

SUB SECTION

SHEET

3 OF 5

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

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

Suitable encoder shall be provided for main hoist motion.

3.0 User interface

3.1 General

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

3.2 Inputs and outputs

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

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

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

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

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

All the control terminals shall be clearly marked.

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



TITLE

TECHNICAL SPECIFICATION of VVVF Drive
Elevator

SPEC. NO. PE-TS-483-502-A001

for VOLUME II - B

SECTION - IIA

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SUB SECTION

SHEET

4 OF 5

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

3.4 Programming terminal

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

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

- i) Drive Status



TITLE

TECHNICAL SPECIFICATION of VVVF Drive Elevator

SPEC. NO. PE-TS-483-502-A001

for VOLUME II - B

SECTION - IIA

DATE JUNE-2021

SUB SECTION

SHEET

5 OF 5

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

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

3.5 Application programming

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

3.6 PC Tools

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

4.0 Software features

A. Restart

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

B. Brake logic control

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

5. Preferred makes:

As per List of makes –ANNEXURE-I

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TITLE

**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. PE – TS – 483 - 502 – A001

VOLUME III

SECTION- III

REV 0 DATE JUNE-2021

SHEET OF

SECTION– III
(DOCUMENTS TO BE SUBMITTED BY THE BIDDER)



TITLE

**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. PE – TS – 483 - 502 – A001

VOLUME III

SECTION- III

REV 0 DATE JUNE-2021

SHEET OF

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III A	List of documents to be submitted with bid.
III B	Compliance cum confirmation certificate.
III C	Electrical load list.
III D	Schedule of Technical Deviation
III E	Pre Bid Clarification Schedule



TITLE

**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. PE – TS – 483 - 502 – A001

VOLUME III

SECTION- IIIA

REV 0 DATE – JUNE-2021

SHEET OF

BIDDER HAS TO SUBMIT ONLY FOLLOWING DOCUMENTS ALONG WITH THE OFFER, FOR TECHNICAL EVALUATION OF THE BID:-

- 1) SCHEDULE OF TECHNICAL DEVIATION (IF ANY)
OR
'NO DEVIATION CERTIFICATE' – Clearly mentioning that bidder has considered 'No - Deviation' from the technical specification provided by BHEL.
- 2) SIGNED AND STAMPED COPY OF COMPLIANCE CUM CONFIRMATION CERTIFICATE.
- 3) Unpriced format, duly mentioned 'Quoted' against each Sl. No. / Clause no.
- 4) Signed and stamped copy of :
 - a) "Specific-Electrical Equipment Specification for elevator.
 - b) "Electrical Scope between BHEL and Vendor" sheet.
 - c) Compliance to /duly filled "Electrical Load Data" sheet.
- 5) Duly signed & stamped copy of civil assignment input drawings.

Note 1:- Any other standard document/ details furnished by the bidder i.e. Data sheet / GA Drawing/ QAP etc. shall not be taken in to consideration for evaluation.

Note 2:- Bidder to note that if the bidder does not submit the documents mentioned in Sl. No. 1.0 to 5.0 along with their offer then their offer is liable to be rejected.



TITLE

**2X500 MW NLC TUTICORIAN TPS
FGD CONTROL BUILDING ELEVATOR**

SPECIFICATION NO. PE-TS-483-502-A001

REV 1

Section III

COMPLIANCE CUM CONFIRMATION CERTIFICATE

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
- h) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions.
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account
- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.
- m) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

335707/2021/PS-PEM-MAX

	TITLE	SPECIFICATION NO. PE-TS-483-502-A001	
	2X500 MW NLC TUTICORIAN TPS FGD CONTROL BUILDING ELEVATOR	REV 1	
		Section III	
		COMPLIANCE CUM CONFIRMATION CERTIFICATE	

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

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

335707/2021/PS-PEM-MAX		LOAD TITLE		RATING (KW)		UNIT (U)/STN (S)		Nos.		VOLTAGE CODE*		FEEDER CODE**		EMER. LOAD (Y)		CONT. (C)/INTT (I)		STARTING TIME		LOCATION		BOARD NO.		CABLE		BLOCK CABLE DRG. No.		CONTROL CODE		REMARKS		LOAD No.					
		NAME PLATE		MAX. CONT. DEMAND (MCR)				RUNNING		STANDBY														SIZE CODE		Nos											
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19	
TG HALL ELEVATOR																																					
ELEVATOR MOTOR		16.5				S		1		0		D		S		-		C		Elevator Machine room																	
2 T A/C FOR TG HALL M/C ROOM AND LIGHTING FOR ELEVATOR M/C ROOM & SHAFT AND MAINTENANCE AND INSTALLATION REQUIREMENT.		7				S		1		0		D		S		-		C		Elevator Machine room																	
Note: 1) No other single phase or 3 phase supply shall be provided for elevator erection / operation etc. 2) Only two (3 phase) supply feeders per elevator shall be provided one feeder shall be dedicated to elevator motor and other 3 phase supply feeder shall be provided by BHEL for air conditioner, machine room and shaft lighting and maintenance / installation requirement. Bidder to consider CT in their scope for stepping down the voltage as per their requirement. <i>Bidder to note: Feeder of indicated rating shall be provided by BHEL. If motor rating is lesser than the provided feeder rating, bidder shall provide protection against over current</i>																																					
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL) 2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (DC): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTOR CONTROLLED) PEM (ELECTRICAL)																																					
		LOAD DATA (ELECTRICAL)		JOB NO.		483		ORIGINATING AGENCY		NAME		DATA FILLED UP ON																									
		PROJECT TITLE		2X500 MW NLC TUTICORIAN		TPS-FGD PKG		SIGN.		DATA ENTERED ON																											
		SYSTEM / S		ELEVATOR		SHEET 1 OF 1		REV. 00		DE'S SIGN. & DATE																											
		DEPTT. / SECTION		MAUX / M/Age 245 of 247																																	

DEVIATION SHEET (COST OF WITHDRAWAL)									
PROJECT:- 2X500 MW NLC TUTICORIAN TPS- FGD.									
PACKAGE:- ELEVATOR									
TENDER ENQUIRY REFERENCE:-									
NAME OF VENDOR:-									
SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWAL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									
PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE									
NAME				DESIGNATIONS			SIGN & DATE		
NOTES:									
1. For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.									
2. For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.									
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.									
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.									
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.									
6. Bidder shall furnish price copy of above format along with price bid.									
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.									
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.									
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.									
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.									
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.									
12. Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.									
13. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.									
14. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.									

TECHNICAL SPECIFICATION FOR ELEVATOR 2X500 MW NLC TUTICORIAN TPS

DATE	JUNE.2021
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SHEET 1 OF 1

[illegible]

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

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