Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G
Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR	Marshalling Cubicle/ Marshalling cum Termination Cabinet	Cage clamp (Rail mount) type.	Posts mount cage clamp type.	F,G
Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp Post mounted type.	Plug in connector/Other System as per manufacturer's Standard	Internal wiring
Marshalling/ Termination System Cabinets	UCD mounted equipments	Post mount cage clamp type.	Plug in connector/Cage clamp type (rail mounted).	F,G (with plug-in connector at one end)
DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard

Notes

1. Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs except for pre-fabricated cables which shall be as per manufacturer's standard.
2. For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided.
3. Also refer Drg. 0000-110-POI-A-021.
4. *For high temperature applications only.
5. Instrument Cabling for instruments/equipments covered under subsection MAIN EQP INST SYS shall be as per manufacturer's standard .

6.00.00	**TERMINAL BLOCKS**
6.01.00	All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg. C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The terminal blocks for DDCMIS input/output connections from/to SWGR/MCC, Actuators with Integral Starter (for coupling relays and check back signals of 11 kV and 3.3 kV auxiliaries, LT drives/valves & dampers/solenoids, CT & VT, etc.) shall be provided with built in test and disconnect facilities complete with plug, slide clamp, test socket etc. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.
6.02.00	All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, test plug bolts and test plug (as specified above for SWGR connections) transparent covers, support brackets, distance sleeves, warning label, marking, etc.
6.03.00	The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. For terminals catering to Employer's supplied system requirement at least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures etc. For terminals catering to contractor's supplied system requirement at least 10% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures termination/marshalling cabinets. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks
6.04.00	For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc, refer Drg no. 0000-999-POI-A-065.
6.05.00	The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.
6.06.00	For ensuring proper connections, Bidder shall provide suitable accessories, along with insulation sleeves. The exact connecting accessory shall be finalised as per application during detail engineering stage subject to Employer's approval without any cost repercussions.
6.07.00	Internal wiring in factory pre-wired electronic equipment cabinets may be installed according to the Bidder's standard as to wire size and method of termination or internal equipment. Terminal blocks for connection of external circuits into factory

prewired electronic equipment cabinets shall meet all the requirements as specified above.

7.00.00 INTERNAL PANELS/ SYSTEM CABINETS WIRING

7.01.00 Internal panel/cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath meeting the requirements of VDE 0815.

7.02.00 Wiring to door mounted devices shall be done by 19 strand copper wire provided with adequate loop lengths of hinge wire so that multiple door opening shall not cause fatigue breaking of the conductor.

7.03.00 All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferules at both ends in Employer's approved format. All wires directly connected to trip devices shall be distinguished by one additional red colour ferrule.

7.04.00 All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.

7.05.00 All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.

7.06.00 All the special tools as may be required for solder less connections shall be provided by Bidder.

7.07.00 Wire sizes to be utilised for internal wiring.

(i)	Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system.	0.5 Sq.mm.
(ii)	Power supply and internal illumination.	2.5Sq.mm. minimum (shall be as per load requirement.)

8.00.00 INSTRUMENTATION CABLE INSTALLATION AND ROUTING

8.01.00 All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Employer.

8.02.00 Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in

bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows:

From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm
From 415V tray system	-	610 mm
From control cable tray system	-	305 mm

8.03.00 Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Fire proof sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance. Compression cable glands (double for armoured and single for other cables) shall be provided.

8.04.00 All cables shall be identified by tag. Nos. provided in Employer's approved format at both the ends as well as at an interval of 5 meters.

8.05.00 Line voltage drop due to high resistance splices, terminal contacts, insulation resistance at terminal block, very long transmission line etc. shall be reduced as far as practicable.

8.06.00 The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.

9.00.00 CABLE LAYING AND ACCESSORIES

9.01.00 **CABLE LAYING**

1 CABLES SHALL BE LAID STRICTLY IN LINE WITH CABLE SCHEDULE.

2 IDENTIFICATION TAGS FOR CABLES.

INDELIBLE TAGS TO BE PROVIDED AT ALL TERMINATIONS, ON BOTH SIDES OF WALL OR FLOOR CROSSING, ON EACH CONDUIT/DUCT/PIPE ENTRY/EXIT, AND AT EVERY 20 M IN CABLE TRENCH/TRAY.

3 CABLE TRAY NUMBERING AND MARKING.

TO BE PROVIDED AT EVERY 10M AND AT EACH END OF CABLE WAY & BRANCH CONNECTION.

4 JOINTS FOR LESS THAN 250 METERS RUN OF CABLE SHALL NOT BE PERMITTED.

5 BURIED CABLE PROTECTION

WITH CONCRETE SLABS; ROUTE MARKERS AT EVERY 20 METERS ALONG THE ROUTE & AT EVERY BEND.

6 ROAD CROSSINGS

CABLES TO PASS THROUGH BURIED HIGH DENSITY PE PIPES ENCASED IN PCC. AT LEAST 300 MM CLEARANCE SHALL BE PROVIDED BETWEEN

- HT POWER & LT POWER CABLES,
- LT POWER & LT CONTROL CABLES
- LT CONTROL & INSTRUMENTATION CABLES,

SPACING BETWEEN CABLES OF SAME VOLTAGE GRADE SHALL BE IN ACCORDANCE WITH THE DERATING CRITERIA ADOPTED FOR CABLE SIZING.

7 SEGREGATION (PHYSICAL ISOLATION TO PREVENT FIRE JUMPING)

A ALL CABLE ASSOCIATED WITH THE UNIT SHALL BE SEGREGATED FROM CABLES OF OTHER UNITS.

B INTERPLANT CABLES OF STATION AUXILIARIES AND UNIT CRITICAL DRIVES SHALL BE SEGREGATED IN SUCH A WAY THAT NOT MORE THAN HALF OF THE DRIVES ARE LOST IN CASE OF SINGLE INCIDENT OF FIRE.

8 CABLE CLAMPING

All cables laid on trays shall be neatly dressed up & suitably clamped/tied to the tray. For cables in trefoil formation, trefoil clamps shall be provided.

9 Optical fiber cables inside conduit shall be laid on cable trays wherever available and feasible. In areas where the same are required to be buried, the same shall be buried in separate trench approx.1.6 meter depth, to be laid in 2” GI/rodent proof HDPE conduits covered with sand, brick and soil along the pipe line route;

While crossing roads - to be laid in GI/rodent proof HDPE conduits with sand filling at bottom and sand, soil filling at top with cement concrete;

While crossing canals/river- to be laid in GI/rodent proof HDPE conduits within hume pipe.

9.02.00	Bidder shall supply and install all cable accessories and fittings like Light Interface Units, Surge suppressors, Opto isolators, Interface Converters, Fibre Optic Card Cage, Fibre Optic Line Driver, Repeater / Modem (for Optical Fibre Cables), cable glands, grommets, lugs, termination kits etc. on as required basis.
9.03.00	Bidder shall furnish two completely new sets of cable termination kits like Crimping tools, etc., which are required for maintenance of the system as per the type of termination used.
9.04.00	Cables, which terminate in cabinets of draw out sections shall have sufficient cable coiled in the bottom of the cabinet to permit full withdrawal of draw out sections without disconnecting the cables. When prefabricated cables with factory connectors on both ends are longer than required, the excess cable shall be coiled in the bottom of one or both termination cabinets.
9.05.00	No splices shall be made in conductors for instrument and control circuits except where required at connections to devices equipped with factory installed pigtails. Such splices shall be made only in approved splicing boxes of fitting with removable cover. The splices shall be made with sufficient slack left in the wires to permit withdrawal of the splice from the splicing box for ease of future disconnection of the splices. All exposed conductor or connector surfaces shall be covered with a minimum of three half-lapped layers of all weather vinyl plastic electrical tape. Taping shall extend a minimum of two cable diameters over the cable jacket and a similar distance over the other insulation or connections requiring insulation.
9.06.00	The Bidder shall be responsible for proper grounding of all equipment under C&I package. Further, proper termination of cable shields shall be verified and the grounding of the same shall be coordinated so as to achieve grounding of all instrumentation cable shields at same potential. This shall be completed prior to system tests. All the cables etc. required for grounding of all equipments supplied under this package are to be supplied by the Bidder.
9.07.00	The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.
10.00.00	**FIELD MOUNTED LOCAL JUNCTION BOXES**

(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.
(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).
(iii)	Type	Door gasket shall be of synthetic rubber.

	(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be of brass, included in Bidders scope of supply. Raceways shall be provided inside JBs for proper termination of cables.
	(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm^2. A M6 earthing stud shall be provided.
	(vi)	Protection Class	IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.
	(vii)	Grounding	To be provided.
	(viii)	Color	To be decided during detailed engineering & subject to Employer's approval.

11.00.00 CONDUITS

11.01.00 Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanised rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated steel, water leak, fire and rust proof. The temperature rating of flexible conduit shall be suitable for the following areas.

(i) Mills

(ii) Drum

(iii) Main steam, RH steam

(iv) Air heater

(v) Furnace, BFP DT's

And for remaining applications, water leak, fire & rust proof flexible G.I conduits shall be provided.

11.02.00 The Bidder shall install conduits according to the general routing as approved by Employer and shall coordinate conduit locations with other works.

11.03.00 All grounding bushings within all enclosures shall be wired together and connected internally to the enclosure grounding lug or grounding bus with 8 AWG bare copper conductor. Conduit runs to individually mounted equipment shall be grounded to the Employer's cable tray grounding conductor with 12 AEG bare copper conductor. All

	grounding bushings, clamps and connectors shall be subject to approval of the Employer.
11.04.00	All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied.
11.05.00	All individually mounted equipment and devices shall be connected to the supply conduit, using not more than one meter of flexible conduit adjacent to the equipment or device. Flexible conduit shall be installed in all conduit runs, which are supported by both building steel and structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by the turbine generator foundation and where conduit supported by building steel or foundation becomes supported by steam generator framing.
11.06.00	Special areas, such as control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room framing.
11.07.00	Conduit supports shall be furnished and installed in accordance with these specifications. Support material shall comply with the following requirements. i) Hanger rods shall be 12 mm diameter galvanized threaded steel rods. ii) Single conduit supports shall be one-hole cast metal straps and clamp backs unless other types are acceptable to the Employer. Multiple conduit bank supports shall be constructed of special galvanized support channels with associated conduit clips.
11.08.00	Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp locations shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform to NEC requirements for the area classification.
11.09.00	Contractor shall provide double locknuts on all conduit terminations not provided with threaded hubs and couplings. Water tight conduit unions and rain tight conduit hubs shall be utilised for all the application which shall be exposed to weather. Moisture pockets shall be eliminated from conduits.
11.10.00	Conduits shall be securely fastened to all boxes and cabinets.
12.00.00	**CABLE SUB-TRAY & SUPPORT**
12.01.00	The cable sub-trays and the supporting system, to be generally used between Local/Group JBs and the main cable trays and the same shall be furnished and

	installed by the Contractor. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure upto the main cable trays (trunk route).
12.02.00	The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded. The cable trays shall not have sharp edges, burrs or projections injurious to the insulation or outer sheath of the cables.
12.03.00	The supporting arrangement of cable tray system shall be able to withstand the weight of the cable and cable tray system. The supporting interval shall not be more than the recommended span for the above loading for the type of cable tray selected. The tray shall not overhang by more than one meter from the support at the dead end. As far as practicable the cable sub-tray system shall be supported from one side only, in order to facilitate installation and maintenance of cables.
12.04.00	The Bidder shall furnish and install the estimated quantities and sizes of sub trays/troughs including all required fittings and adaptors on as required basis.

INSTRUMENTATION CABLE

TESTS / ITEMS	Conductor Resistance ® & (A)	High Voltage ® & (A)	Insulation Resistance ® & (A)	Constructional detail, dimensions (A)	Outer-Sheathe/core marking, end sealing (A)	Thermal Stability (A) +	Visual, Surface finish (A) +	Electrical Parameters ** (A) +	Persulphate Test (A) +	Overall/Coverage/Continuity (A)	Swidesh chimney Test (SS-4241475) (A) ++	FRLS Test * (A) ++	Tensile & Elongation before & after aging (A) ++	Vol. Resistivity. at room & Elevated Temp. (A) ++	Spark test report review ®
1. Instrument cable twisted and shielded															
Conductor(IS-8130)	Y			Y			Y								
Insulation(VDE-207)				Y	Y	Y	Y						Y		Y
Pairing/Twisting				Y	Y		Y								
Shielding				Y			Y			Y					
Drain wire	Y			Y			Y		Y	Y					
Inner Sheath				Y	Y	Y	Y					Y	Y		
Outer Sheath				Y	Y	Y	Y					Y	Y		
Over all cable	Y	Y	Y	Y	Y		Y	Y			Y			Y	
Cable Drums(IS-10418)				Y			Y								

Note : High Temp. cables shall be subjected to tests as per VDE-207(Part-6) Compensating cables shall be checked for Thermal EMF/Endurance test as per IS 8784.

Note : This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating his practice & Procedure along with relevant supporting documents during QP finalization for all items.

Note : ® - Routine Test A - Acceptance Test Y - Test Applicable

Note : Sampling Plan for Acceptance test shall be as per IS 8784 (As applicable)

- * FRLS Tests: Oxygen / Temp Index (ASTM D-2863), Smoke Density Rating (ASTM – D 2843), HCL Emission (IEC-754-1)
- ** Characterisitic Impedence, Attenuation, Mutual Capacitance, Cross Talk (As applicable)

\+ Sample size will be One No. of each size/type per lot.

++ Sample size will be One No. sample for complete lot offered irrespective of size/type.

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LIGHTING

LIGHTING

1.00.00 GENERAL

1.01.00 This specification covers the general description of design, manufacture and construction features, testing, supply, installation and commissioning of the Lighting system equipment.

2.00.00 CODES AND STANDARDS

2.01.00 All standards and codes of practice referred to herein shall be the latest edition including all applicable official amendments & revisions. In case of conflict between this specification and those (IS codes, standards etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards & codes.

2.02.00 Lighting Fixtures and Accessories

IS:1913	General and safety requirements for luminairies.
IS:2148	Flame proof enclosures of electrical apparatus.

2.03.00 Lighting Panels, Switch-boxes, Receptacles and Junction Boxes

IS:2147	Degree of protection provided by enclosures for low-voltage switchgear and control gear.

2.04.00 Electrical Installation Practices & Miscellaneous

IS:1944	Code of practice for lighting of public thorough fare
IS:3646	Code of practice for interior illumination.
IS:5572	Classification of Hazardous areas (other than Mines) having flammable gases and Vapours for electrical installation
IS:6665	Code of practice for industrial lighting.
	National Electrical Code
	Indian Electricity Rules.
	Indian Electricity Act

3.00.00 **DESIGN PHILOSOPHY**

1. A comprehensive illumination system shall be provided for the Hydrogen plant

2. All lighting system shall be automatically controlled by synchronous timer or photocell. Provision to bypass the timer or photocell shall be provided in the panel.

3. In the Off site area / buildings DC lighting shall be provided by self-contained 4hours duration Emergency lighting fixtures. Each shall be provided with Ni-cd battery, battery Charger & 2x10 W fluorescent lamps

4. The system shall include distribution boards, normal/ emergency lighting panels, lighting fixtures, junction boxes, receptacles, switch boards, conduits, cables and wires, etc. The system shall cover all interior and exterior lighting such as area lighting. The constructional features of lighting distribution boards shall be similar to AC/DC distribution boards described in chapter of LT Switchgear. Outgoing circuits in LPs shall be provided with MCBs of adequate ratings.

5. The illumination system shall be designed on the basis of best engineering practice and shall ensure uniform, reliable, aesthetically pleasing and glare free illumination. The diffusers/ louvres used in fluorescent fixtures shall be made of impact resistant polystyrene sheet and shall have no yellowing property over a prolonged period.

6. Apart from maintenance factor as given below, Temperature correction factor shall be considered in the lighting design for fluorescent fixtures located in non air conditioned area. Similarly the correction factor towards ageing of lamps , as recommended by the lamp manufacturer shall also be considered in the lighting design.

   (a) Office area air conditioned : 0.8

   (b) Office area non air conditioned and other indoor area : 0.7

   (c) Dust prone and outdoor area : 0.6

7. All outdoor fixtures shall be weather proof.

8. Wires of different phase shall normally run in separate conduit.

9. Power supply shall be fed from 415V normal AC supply, through suitable number of conveniently located lighting panels (LP). AC lighting supply shall be isolated from main supply by 2X100 % isolation transformers of rating 50KVA/100KVA for 10/15 nos. outgoing feeder with changeover switch facility. The isolation transformer shall be fed from two different bus sections of MCC. Fault level shall be restricted to 3 KA at Lighting Panels.

10. Atleast one 6/16A, 240V AC universal socket outlet with switch shall be provided in offices, cabins, etc. 20A, 240V AC industrial receptacle with switch shall be provided strategically in all industrial area. Suitable number of 63A,3ph., 415V AC industrial receptacles shall be provided for entire plant for welding purposes, particularly near all major equipment and at an average distance of 50m. Atleast one 63A,3ph.,415V AC receptacle shall be provided in each off site building.

11. Average lux level of 150 lux shall be maintained in hydrogen plant and 20 lux shall be maintained in outdoor areas. The type of fixtures, LP, JB, and receptacle used in Hydrogen generation plant building shall be suitable for group-IIC as per IS:2148 or Class-I division-II as per NEC.

3.01.00 **Ballasts**

(a) All HPSV and HPMV lamp fixtures shall be provided with wire-wound ballasts. All fluorescent fixtures except for Class-I, Div-IIC fittings/ increased safety fittings (Div-II/Hazardous Area) installed area shall be provided with electronic ballasts.

3.02.00 All luminaires and their accessories and components shall be of type readily replaceable by available Indian makes.

3.03.00 **Fans & Regulator**

Ceiling Fans, to be provided in non air conditioned office/control room area, shall be suitable for operation on 240 V+/- 10%, 50 Hz, AC supply comprising of class 'E' insulated copper wound single phase motor, 1200mm sweep, aerodynamically designed well balanced Aluminum blades (3 Nos.), down rod, die cast aluminum housing, capacitor, suspension hook, canopies etc. finished in stove enameled white. Power factor of fans shall not be less than 0.9. Each fan shall cover approximately 10sq.m. area.

3.04.00 **Switch Box**

Switch boxes shall be made of 1.6 mm thick, MS sheet with 3 mm. thick decorative, perspex cover. Switchbox shall be hot dip galvanised

3.05.00	**Junction boxes**
3.05.01	Junction box for lighting fixtures shall be deep drawn or fabricated type made of min. 1.6 mm thick CRCA Sheet. The box shall be hot dip galvanised.
3.06.00	**Conduits, Fittings & Accessories**
3.06.01	Galvanised heavy duty steel conduits for normal area and galvanised heavy duty steel conduits with an additional epoxy coating for corrosive area shall be offered. Alternatively glass reinforced epoxy conduits with comparable compressive and impact strength with that of heavy duty steel conduits may be offered.
3.06.02	**Rigid Steel Conduits** (a) Rigid steel conduits shall be heavy duty type, hot dip galvanised conforming to IS : 9537 Part-I & II shall be suitable for heavy mechanical stresses, threaded on both sides and threaded length shall be protected by zinc rich paint. Conduits shall be smooth from inside and outside.
3.06.03	**Flexible Steel Conduits** Flexible conduit shall be water proof and rust proof made of heat resistant lead coated steel.
3.06.04	**Pull-out Boxes** Pull out boxes shall be provided at approximately 4 (four) metre interval in a conduit run .Boxes shall be suitable for mounting on Walls, Columns, Structures, etc. Pull-out boxes shall have cover with screw and shall be provided with good quality gasket lining. Pull out boxes used outdoor shall be weather proof type suitable for IP :55 degree of protection and those used indoor shall be suitable for IP :52 degree of protection. Pull out box & its cover shall be hot dip galvanised.
3.07.00	**Lighting Wires** Lighting wires shall be 1100 V grade, light duty PVC insulated unsheathed, stranded copper/aluminum wire for fixed wiring installation. colour of the PVC insulation of wires shall be Red, Yellow, Blue and Black for R,Y,B phases & neutral, respectively and white & grey for DC positive & DC negative circuits, respectively. Minimum size of wire shall not be less than 1.5.sq.mm. for copper and 4 sq.mm. for aluminum.
4.00.00	**TESTS**
4.01.00	All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the

date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

4.02.00 However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

4.03.00 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

4.04.00 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design change”. Minor changes if any shall be highlighted on the endorsement sheet.

4.05.00 Selection of samples for type test, acceptance test & routine test and acceptance criteria for all the items shall be as per relevant I.S

4.06.00 Type test reports of the following items as per relevant standards shall be submitted for approval.

SL NO.	DESCRIPTION
i.	Lighting panel of each type (Degree of Protection)
ii.	Junction Box of each type
iii.	Receptacles of each rating (Degree of Protection)

4.07.00 **Acceptance Test and Routine Test**

4.07.01 All lighting fixtures, lamps and other items shall be subjected to acceptance and routine test, as per relevant specified standards.

4.07.02 Junction boxes, switch boxes, receptacle enclosure etc. shall be subjected to physical and dimensional checks.

4.08.00 **Galvanizing Tests**

4.08.01 The quality of galvanizing shall be smooth, continuous, free from flux stains and shall be inspected visually.

4.08.02 In addition following tests shall be conducted as acceptance tests.

(a) Uniformity of coating - The coating of any article shall withstand four 1minute dips in standard copper sulphate solution without the formation of an adherent red spot of metallic copper upon the basic metal.

(b) The quality of cadmium/zinc plating on items with screw threads shall be free from visible defects such as unplated areas, blisters and modules and shall be inspected visually.

(c) In addition, the plating thickness shall be determine microscopically/ chemically or electronically.

LIGHTING

Item Components / Sub System / Assembly — Attributes / Characteristics	Make, Type , Rating/ TC	Dimension	Pre-Treatment of sheets	Paint Shade Thickness Adhesion & Finish	Test for Galvanization	IP Test	Bought Out Items/ Bill of Material	HV & IR	Functional Check as per spec.	Constructional Feature as per NTPC spec.	Routine Test as per relevant std and spec	Acceptance Test as per relevant std and spec	Item to conform to relevant standard
Luminaries (IS-10322 Part-5 Sec.1; IS- 2206)	Y					Y		Y			Y	Y	
Electronic Ballast	Y										Y	Y	Y
Lighting Wire (IS-694)	Y										Y		
Pole (IS-2713)	Y			Y						Y	Y	Y	
Lamps (IS-9800, IS-9974)	Y										Y	Y	
Switch Box/ Junction Box/Receptacles/ Local Push Button, Lighting Panel / flame proof type (IS-513, 2629, 2633, 4759, 6745, 2148)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Cable Gland (BS-6121)	Y	Y									Y		
Cable Lug (IS-8309)	Y	Y									Y		
Flexible Conduit	Y										Y		
Lighting Transformer (IS-1117, 11333)	Y									Y	Y		
Epoxy & Galvanised Conduit (IS-9537, 2629, 2633, 4759, 6745)	Y	Y									Y		Y

Notes:
1. This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2. Make of all major Bought Out Items will be subject to NTPC approval.

CABLING, EARTHING, LIGHTNING PROTECTION

ATTRIBUTES / CHARACTERISTICS ITEMS/COMPONENTS / SUB SYSTEMS	Dimension	Paint shade, paint thickness, adhesion	Pre-treatment of sheet	IP protection	Proof load*	Surface finish	Deflection test*	HV & IR	Galvanise Test (If Applicable)	Functional	Bought out items/Bill of material	Routine tests as per relevant standard & specification	Acceptance tests as per relevant standard & specification	Constructional feature as per NTPC
Cable glands(BS-6121)	Y											Y		
Cable lug(IS-8309)	Y											Y		
Lighting wire(IS-694)	Y											Y		
Flexible conduits	Y											Y		Y
Conduits(Galvanized & Epoxy) IS-9537 & IS-2629,2633 ,6745	Y		Y								Y	Y		Y
RCC Hume Pipe (IS-458)												Y		
Cable straight through joint (VDE-0278)	Y											Y		Y
Cable Trays, & supports system & accessories IS-513, 2629,2633,6745	Y		Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Trefoil clamp	Y													Y
GI flats for earthing & lighting protection (IS 2062, 2629, 6745,2633)	Y		Y						Y			Y		Y
GI wire (IS-280)	Y											Y		
Fire Sealing System (BS – 476)												Y	Y	Y

.Note:1.This is an indicative list of tests /checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2. Make of all items will be subject to NTPC approval.

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

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

NOTES:

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

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

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

Legends for Inspection agency

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

P. PERFORM
W. WITNESS
V. VERIFY

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

ANNEXURE– A

LIST OF MANDATORY SPARES

MANDATORY SPARES

LARA SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART - A

1.00.00 **SPARES**

The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spares is given below:-

1.01.00 **MANDATORY SPARES**

(a) The list of mandatory spares considered essential by the Employer is indicated in this chapter. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms and Price Schedules. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.

(b) The Employer reserves the right to buy any or all the mandatory spares parts.

(c) The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.

(d) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments.

(e) Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.

1.02.00 **RECOMMENDED SPARES**

(a) In addition to the spare parts mentioned above, the contractor shall also provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and total prices in relevant schedule of the Bid Form and Price Schedules. This list shall take into consideration the mandatory spares specified in this Section-VI, Part-A and should be independent of the list of the mandatory spares. The Employer reserves the right to buy any or all of the recommended spares. The recommended spares shall be delivered at project site at least two months before the scheduled date of initial operation of first unit. However, the spares shall not be dispatched before the dispatch of the main equipment.

(b) Price of recommended spars will not be used for evaluation of the bids. The price of these spars will remain valid upto 6 months after placement of Notification of Award for the main equipment. However, the Contractor shall be liable to provide necessary justification for the quoted prices for these spares as desired by the Employer.

1.03.00 **START-UP & COMMISSIONING SPARES**

Start-up and commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the employer shall come under this category. The Contractor shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Contractor.

1.04.00 The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spars is given below.

2.00.00 The Contractor shall indicate the service expectancy period for the spares parts (both mandatory and recommended) under normal operating conditions before replacement is necessary.

3.00.00 All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.

4.00.00 All the spares (both recommended and mandatory) shall be manufactured alongwith the main equipment components as a continuous operation as per same specification and quality plan.

5.00.00 The contractor will provide Employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the Employer to identify and finalise order for recommended spares.

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

7.00.00	All cases, containers or other packages are to be opened for such examination as may be considered necessary by the Employer.
8.00.00	The contractor will provide the Employer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the Employer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.
9.00.00	The Contractor shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.
10.00.00	In addition to the recommended spares listed by the contractor, if the employer further identifies certain particular items of spares, the contractor shall submit the prices and delivery quotation for such spares within 30 days of receipt of such request with a validity period of 6 months for consideration by the Employer and placement of order for additional spares if the Employer so desires.
11.00.00	The Contractor shall guarantee the long term availability of spares to the Employer for the full life of the equipment covered under the contract. The Contractor shall guarantee that before going out of production of spares parts of the equipment covered under the Contract, he shall give the Employer atleast 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to sub-contractors. Further, in case of discontinuance of manufacture of any spares by the Contractor and/or his sub contractors, Contractor will provide the Employers, two years in advance, with full manufacturing drawings, material specifications and technical information including information on alternative equivalent makes required by the Employer for the purpose of manufacture/procurement of such items.

SL. NO.	ITEM	QUANTITY
34	**Condenser Polishing Unit**	
	A) Screens and Nozzles for Under Drain System	
	a) Activated Carbon filter	15% of Ac filter vessel
	b) Polisher Service Vessel	100% of one vessel
	B) Under Drain System screens, nozzles/headeral lateral/any other type used for	
	a) Cation Regeneration Unit	1 Set
	b) Anion Regeneration Unit	1 Set
	c) Mixed Resin Storage Unit whichever applicable	1 Set
	C) All Resins (Cation, Anion & Inert resins)	One full charge required for one Service vessel
35.	**Passenger Elevator**	
35.1	Over current relay	2 Nos. of each type
35.2	Auxiliary relays	3 Nos. of each type
35.3	Friction block	2 Nos.
35.4	Guide roller of each type	20% of total population or 3 Nos. of each type whichever is high
35.5	Contactors of each type	2 Nos.
35.6	Control transformer	1 No. of each type

SL. NO.	ITEM		QUANTITY
35.7	Time device		2 Nos. of each type
35.8	Rectifiers		2 Nos. of each type
35.9	Resistor		3 Nos. of each type
35.10	Fuses of each rating		20% of the total population
35.11	Limit switches of each type		3 Nos.
35.12	Push button		3 Nos. of each type
35.13	Contact device (if applicable)		3 Nos. of each type
35.14	Brake motor		2 Nos. of each type
35.15	Transmitters		2 Nos. of each type
35.16	Switches of each type		3 Nos.
35.17	Receiver		2 Nos. of each type
35.18	Bearings of each type & size		2 Nos.
35.19	Roller of each type		3 Nos.
35.20	Worm gear spares		
	a)	‘O’ rings	3 Sets
	b)	Sealing ring of each type	3 Sets
35.21	Spares for brake		
	a)	Fan	2 Nos. of each type
	b)	Magnetic coil	3 Nos. of each type

SL. NO.	ITEM		QUANTITY
	c)	Brake disc	2 Sets
	d)	Brake pad	2 Sets
35.22	Bushing (for door front)		2 Sets
35.23	Pinion		2 Nos. of each type

GENERAL NOTE:

1. Unless stated otherwise a 'Set', it will include the total requirement of the item for a unit module or the station as specified. Also are set for the particular equipment e.g. 'set' of bearings for a pump would include the total number of bearings in a pump. Also the 'set' would include all components required to replace the item; for example a set of bearing shall include all hardware normally required while replacing the bearings. It is further, intended that the assembly/sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in maintaining two different sets of the spares to be used for the subject assembly/sub-assembly, these shall be considered as different types of assembly/sub-assembly.

2. Wherever quantity has been specified as percentage (%), it shall mean percentage (%) of the total population of the item in the station (project), unless specified otherwise and the fraction will be rounded off to the next higher whole number.

3. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc. these shall cover all the items supplied and installed and the break up for these shall be furnished in the bid.

4. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

5. Interchangebility and Packings:

   All spares supplied under this contract shall be strictly interchangeable with parts for which they are intended for replacements. These spares should include all mounted accessories like components, boards, add or items, fitting, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require any additional item. The vendors must conform the pair to pair compatibility of each electrical spares modules with the modules should be supplied in the

original package. All electronic modules should be pre set and/or preprogrammed for ready use at site. Alternatively, suitable instruction sheet indicating the details of required PCB jumper position, BCD which is setting, EPROM/PROM listing etc should be packed along with each module. Also a caution mark sign should be put on all such module which needs pre setting/pre programming before putting them in to service. The spare shall be treated and properly packed for long term storage

6. Identification:

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

7. Control & Instrumentation Mandatory Spares for specific sub-systems such as hydrogen generation plant and Condensate Polishing Unit (if applicable), the spares shall be governed by the spares indicated against the corresponding specific clauses only. For all remaining systems / equipments offered under the present scope of work, the spares shall be offered in totality as per the complete C&I items supplied in accordance with the applicable clauses of C&I items

Document required to be submitted along with offer.

- Deviation schedule available in Un-priced schedule
- Electrical load data format duly filled signed & stamped
- Electrical portion of specification duly signed & stamped
- Un-priced format with “quoted” indicated in each required cell.
- Compliance cum confirmation certificate duly signed & stamped
- PQR document (as required in NIT-PQR)

Note : In case bidder fails to furnish any document specified above, bidder’s offer may be rejected.

ANNEXURE – II
Drawings / documents distribution schedule

DRAWINGS AND DOCUMENTS REQUIREMENT

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

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

SECTION – D
DATA SHEET A,

S. No.	DESCRIPTION	2X800 MW GADARWARA STPP.
1.	Elevator Type	1) TG Building (conventional type) 2) Service Building (conventional type) 3) Admin. Building (Panoramic type)
2.	Type of Service	Passenger elevator
3.	Rated Load on Elevator	1088KG (16 Person)
4.	Quantity	1) TG Building 2Nos.(1no.per TG Buildg.) 2) Service Building 2Nos. 3) Admin. Building 2Nos.
5.	Rated Speed of Lift	1.0 M/Sec
6.	Total Travel	1) TG Building 41M 2) Service Building 18M 3) Admin. Building 15M
7.	Nos. of floors to be served	1) TG Building-6 including ground and one dummy landing 2) Service Building-5 including ground 3) Admin. Building-4 including ground
8.	Method of control	ACVVVF Control with automatic level adjustment.
9.	Position of Machine Room	Directly above the lift Shaft.
10.	Car enclosure construction, design and finish car	SS -304, 1.5 mm thk. sheet,
11.	Design, construction, installation codes including car size, door size, Shaft size, Size of platform and car entrance	As per IS: 14665 (all parts), latest edition
12.	Car and landing door	Horizontal bi-parting door
13.	Flooring	Vitrified ceramic tiles of mat finish.
14.	Operation	Selective Duplex collective with and without attendant with provision for locking control in “auto” or “Attendant” position. Key type lock switch shall be provided.
15.	Signal	Car position indicator in car, car position indicator at car floors, telltale lights at all floors, battery operated alarm bell and emergency light with suitable battery, battery charger and controls, Remote alarm shall be provided.
16.	Method of operation of car and landing doors.	Power operated with automatic door opening and closing devices.
17.	Lighting & fan	One cabin fan, two recessed fluorescent lamp fittings of lux level : 100 min.
18.	Power supply :	415 Volts, (+/- 10% variation), 3 Phase,

	a) Power b) Lighting & fan	50 Hz (+3% to -5% variation), 3 wire system, 240 Volts, 1 Phase, 50 c/s.
19.	Other requirements	Internal telephone wiring and telephone hand set to be provided. The external connection shall be provided by Customer. Also, automatic rescue device shall be provided.
20.	Additional requirements :-	
a)	Isolating cushion between car and car frame shall be provided.	Type of cushion shall be rubber pad or spring which shall be as per manufacturer's standard.
b)	Three pin plug with socket on car top	5/15A, 3 pin plug socket with switch on top of lift car.
c)	Car frame Material and type of construction	Steel and bolted construction
d)	Landing Door	Fire rated for min. 1 hour
e)	Type of operation	Automatic
f)	Door hanger tracks along with accessories shall be provided.	Required
g)	Safety shoes complete with accessories shall be provided.	Yes
h)	Safety device for door operation shall be provided.	Full length Infrared light curtain is required.
i)	Handrails on three sides	Mirror finish stainless steel
j)	False ceiling	SS304 1.5 mm thick hairline finish
k)	Emergency stop switch	Yes
21.	Control and operation	
	(a)Type of control	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 per IS 14665	Yes (To be provided by supplier)
26.	Emergency Light	Required

27.	Terminal buffers, their types and number of buffers	Spring buffers shall be Provided as per IS 14665.
28.	Load plate	As per manufacturer's standard / as applicable
29.	Counter weights frame	Fabricated Steel Construction
30.	Counter weight fillers	Cast Iron
31.	Number of Limit Switches	As per requirement
	a) Location	Bottom & top terminal
	b) Type	Electromechanical
	c) Operation	Cam Operated
32.	Controller and type	Selective Collective Controller with variable voltage variable frequency drive and Microprocessor based software controlled logic system
33.	Reverse phase relay and other protective devices	Required
34.	Car Safety & Governor	
	a) Stopping distance	As per IS:14665
	b) Type and mode of operation of Over speed Governor device	Centrifugal action
	c) Tripping speed and design code conforming to	As per IS 14665
	d) Location	At machine room
35.	Motor details	
	(a) Type	3 phase AC squirrel Cage Induction motor
	(b) Type of Duty	Lift Duty
	(c) Motor Duty	S4
	(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	130(B) or better insulation
	i)Method of Starting	AC Variable Voltage Variable Frequency Drive
36.	Door Motor	
	a) Equipment driven by Motor	Door
	b) Direction of rotation	Both Clockwise & Anticlockwise
	c) Type of enclosures	IP54
37.	Metallic Wire Mesh between Car & Counter Weight	Required
38.	Fire Man Switch	Required
39.	Sound Reducing Material	Isolation Rubber / other arrangement in the Machine shall be provided

40.	Automatic Rescue Device	Provided
41.	Trailing cables	FRLS type
42.	Design seismic coefficient	According to IS 1893 - 1977
43.	Window Air condition in each elevator machine room.	Min 2T Capacity.
44	Fire Extinguisher	1/2 Kg CO2

	TITLE	SPECIFICATION NO. PE – TS - 394 - 502 – A001
BHEL	**TECHNICAL SPECIFICATION FOR ELEVATORS**	VOLUME III
		SECTION
		REV 0 DATE 20 - 03- 14
		SHEET OF

Volume – III

COMPLIANCE CUM CERTIFICATE

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

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those resolved as per 'Schedule of Deviations', with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price with extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

   For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself. Prices for special tools & tackles, if any, shall also be included in the base price.

g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

h) The Performance guarantees shall stand valid till at least eighteen (18) months after full load commissioning of Elevator or as per commercial terms and conditions, whichever is later.

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and/ or consultant's comments. No extra claims shall be put on this account.

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) That the bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

ANNEXURE-II: DEVIATION SHEET (COST OF WITHDRAWL)

PROJECT:- 2X800 MW GADARWARA STPP

PACKAGE:- ELEVATORS

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

S. No.	DESCRIPTION	2X800 MW GADARWARA STPP.
1.	Elevator (conventional type)	
2.	Type of Service	
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	
9.	Position of Machine Room	
10.	Car enclosure construction, design and finish car	
11.	Design, construction, installation codes including car size, door size, Shaft size, Size of platform and car entrance	
12.	Car and landing door	
13.	Flooring	
14.	Operation	
15.	Signal	
16.	Method of operation of car and landing doors.	
17.	Lighting & fan	
18.	Power supply : a) Power b) Lighting & fan	
19.	Other requirements	
20.	Additional requirements :-	
a)	Isolating cushion between car and car frame shall be provided.	
b)	Three pin plug with socket on car top	
c)	Car frame Material and type of construction	
d)	Landing Door	
e)	Type of operation	
f)	Door hanger tracks along with accessories shall be provided.	
g)	Safety shoes complete with accessories shall be provided.	
h)	Safety device for door operation shall be provided.	
i)	Handrails on three sides	

j)	False ceiling	
k)	Emergency stop switch	
21.	Control and operation	
	(a)Type of control	
	(b)Type of drive	
22.	Car operating panel	
	(a)Type of construction	
	(b)Push Buttons	
23.	Car position indicator	
	(a)Type of construction	
	(b)Type of display	
24.	Push button station and call registered tell tale lights at each landing	
	(a)Type of construction	
	(b)Push Buttons	
25.	Apron / Facia Plate provided as per IS 14665	
26.	Emergency Light	
27.	Terminal buffers, their types and number of buffers	
28.	Load plate	
29.	Counter weights frame	
30.	Counter weight fillers	
31.	Number of Limit Switches	
	a) Location	
	b) Type	
	c) Operation	
32.	Controller and type	
33.	Reverse phase relay and other protective devices	
34.	Car Safety & Governor	
	a) Stopping distance	
	b) Type and mode of operation of Over speed Governor device	
	c) Tripping speed and design code conforming to	
	d) Location	
35.	Motor details	
	(a) Type	
	(b) Type of Duty	
	(c) Motor Duty	
	(d) Duty Cycle of Motor	
	(e) Applicable standard	

	f) No. Of Starts Per Hour	
	g)Direction of rotation	
	h)Class of Insulation	
	i)Method of Starting	
36.	Door Motor	
	a) Equipment driven by Motor	
	b) Direction of rotation	
	c) Type of enclosures	
37.	Metallic Wire Mesh between Car & Counter Weight	
38.	Fire Man Switch	
39.	Sound Reducing Material	
40.	Automatic Rescue Device	
41.	Trailing cables	
42.	Design seismic coefficient	
43.	Window Air condition in each elevator machine room.	

	TITLE	SPECIFICATION NO.
	MOTOR	VOLUME II B
	DATA SHEET - C	SECTION D
		REV NO. 00 DATE 20.03.14
		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			

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

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.	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																		
1) ELEVAT0R MOTOR			U	1	0	D	S	-	C		Each TG HALL Elevator Machine room							
2) 2 T AC FOR TG HALL *M/C* ROOM AND LIGHTING FOR ELEVATOR *M/C* ROOM & SHAFT)			U	1	0	D	S	-	C		Each TG HALL Elevator Machine room	One (1) no. 415 V 3phase 3 wire feeder shall be provided. Bidder shall put CT (control transformer) for stepping down of voltage to meet min 2T air conditioner and shaft & machine room lighting power requirement.						
Service Building Elevator																		
3) ELEVAT0R MOTOR			S	2	0	D	S	-	C		Elevator Machine room							
4) 2 T AC FOR TG HALL *M/C* ROOM AND LIGHTING FOR ELEVATOR *M/C* ROOM & SHAFT)			S	2	0	D	S	-	C		Elevator Machine room	Two (2) no. 415 V 3phase 3 wire feeder shall be provided. Bidder shall put CT (control transformer) for stepping down of voltage to meet min 2T air conditioner and shaft & machine room lighting power requirement						

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ 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)

BHEL	**LOAD DATA (ELECTRICAL)**	JOB NO.	394	ORIGINATING AGENCY		PEM (ELECTRICAL)
		PROJECT TITLE	2 X 800 MW GADARWARA TPP	NAME		DATA FILLED UP ON
		SYSTEM	ELEVATORS	SIGN.		DATA ENTERED ON
		DEPTT. / SECTION	ELECTRICAL/MAUX	SHEET 1 OF 2	REV. 00	DE'S SIGN. & 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.	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
Administrative Building Elevator																		
5) ELEVAT0R MOTOR			S	2	0	D	S	-	C		Elevator Machine room							
6) 2 T AC FOR TG HALL *M/C* ROOM AND LIGHTING FOR ELEVATOR *M/C* ROOM & SHAFT)			S	2	0	D	S	-	C		Elevator Machine room	Two (2) no. 415 V 3phase 3 wire feeder shall be provided. Bidder shall put CT (control transformer) for stepping down of voltage to meet min 2T air conditioner and shaft & machine room lighting power requirement						
Note: No other single phase or 3 phase supply shall be provided for elevator erection / operation etc.																		

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)

BHEL VH	LOAD DATA (ELECTRICAL)	JOB NO.	394	ORIGINATING AGENCY		PEM (ELECTRICAL)
		PROJECT TITLE	2 X 800 MW GADARWARA TPP	NAME		DATA FILLED UP ON
		SYSTEM	ELEVATORS	SIGN.		DATA ENTERED ON
		DEPTT. / SECTION	ELECTRICAL/MAUX	SHEET 2 OF 2	REV. 00	DE'S SIGN. & DATE

	TITLE	SPECIFICATION NO.: PE-TS-394-502-A001
	SCHEDULE OF FUNCTIONAL TEST	VOLUME III PART A
		SHEET OF

S.N.	ITEM	UNIT OF MEASUREMENT	GURANTEED VALUE

We the undersigned hereby undertake to meet the performance guarantees as listed in the table above on the conditions as elsewhere specified. Any variation of the specified conditions during official test will be taken in to account by the customer.

PARICULARS OF BIDDER / AUTHORISED REPRESENTATIVE			
NAME	DESIGNATION	SIGN DATE	COMPANY SEAL

MDL FOR ELEVATOR

S.N 0.	BHEL DOC No	TITLE	Submission Schedule (From LOI)	APP. CAT
		2x800 MW GADARWARA STPP STG PACKAGE.		
1	PE-V0-394-502-A001	GAD OF ELEVATOR FOR TG	1 WEEK	A
2	PE-V0-394-502-A004	GAD OF ELEVATOR FOR SERVICE BUILDING	1 WEEK	A
3	PE-V0-394-502-A003	GAD OF ELEVATOR FOR ADMINISTRATIVE BUILDING	1 WEEK	A
4	PE-V0-394-502-A105	DATA SHEET OF ELEVATOR FOR TG & SERVICE BUILDING	2 WEEKS	A
5	PE-V0-394-502-A106	DATA SHEET OF ELEVATOR FOR ADMINISTRATIVE BUILDING	2 WEEKS	A
6	PE-V0-394-502-A002	MQP OF ELEVATOR- TG PACKAGE	1 WEEK	A
7	PE-V0-394-502-A007	CONTROL & WIREING DIAGRAM OF ELEVATOR	1 WEEK	I
8	PE-V0-394-502-A008	O&M MANUAL	5 WEEKS	I

Note:

1) BHEL/NTPC shall submit the comments within 21 days

2) vendor shall resubmit the documents within 10 days

3) Incomplete submission shall not be considered