SUBSECTION 9: PUMPING STATIONS (ELECTRICAL EQUIPMENT)

9.1 GENERAL

1 General

Following clauses specify General Electrical requirements and standard of workmanship for the equipment and installations. General specification classes shall apply where appropriate except where particularly redefined in the Special Specification Clauses.

2 Standards

The equipment offered shall comply with the relevant Indian Standards. The equipment conforming to any other approved International Standards which is considered equivalent or superior shall be acceptable. The tenderer however, shall have to substantiate equivalence or superiority.

3 Requirement of Statutory Authorities

The electrical equipment/installations shall comply with the requirements of Rules/Regulation as amended up-to-data, required by Statutory Acts or Authorities.

- The Indian Electricity Rules, 1956
- The Indian Electricity Act.
- The Indian Electricity (Supply) Act, 1948
- The requirements of Chief Electrical Inspector to the Government of Tamil Nadu.
- The requirement of Maharashtra State Electricity Board.
- Fire advisory Committee Insurance Act.
- The contractor shall get the drawings, layouts of HT substation etc. approved from RELIANCE ENERGY and chief Electrical inspector to the Govt. of Maharashtra, wherever necessary. The contractor also shall arrange to get the installation inspected by CEIG and carryout modifications/ rectification as required by CEIG, prior to commissioning of substation/electrical equipments.

4 H-Frame Steel Structure

H-frame galvanized steel self supporting structure shall generally have the following equipments.

- Lightning Arresters
- Gang Operated A.B Switch
- DO Fuses
- String Insulators
- Pin Insulators
- ACSR conductors of appropriate sizes to connect all the equipments

4.1 Lightning Arrester

Lightning arresters shall be provided on each 11KV line before the termination on the 11KV isolators in the switch yard. Lightning Arresters shall be suitably mounted on H pole structure or 4 pole structure for receiving 11kv supply as per IS 3070 Part I.

4.2 Gang Operated AB Switch

The Switches shall be provided with horizontal connecting bar, for gang operation, G.I pipe as down rod lever coupling and operating handle with padlock and other components necessary for complete assembly.

4.3 11KV Drop-Out Fuses

The IIKV drop-out fit off fuses shall offer protection against short circuit and suitable for use in conjunction with 11KV system having fault level of 500 MVA as per relevant ISS.

A suitable insulated operating rod shall be provided with each fuse assembly. Two pairs of rubber hand gloves for working on 11KV shall be provided.

4.4 Insulators

The disc, pin and post type insulators used shall be of high quality glazed porcelain. The electrical and mechanical characteristics shall conform to IS:731 and IS:254. The insulators shall have following characteristics suitable for use in an effectively earthed system.

- System voltage : 11kv

- Dry Wet one- minute power Frequency to withstand voltage : 22kv

- 1.2/50 micro second impulse withstand voltage : 75kv

- Power frequency puncture withstand test voltage on units : 1.3 times of the dry flash over voltage of the unit.

- Visible discharge voltage : 9KV

- Total minimum creep age distance for post and disc insulator : 320 MM FOR POST INSULATION
  320 MM FOR DISC INSULATION

5 Power Transformers

5.1 General

TRANSFORMER SHALL BE 11KV /0. 433KV

Type: Outdoor in general. In case of indoor, sub station shall be indoor type, mineral oil filed natural cooled ONAN as per standard IS 2026 with of circuit tap changer of + 5 to - 10% in steps of 2.5%. Adequate number of radiator elements made of low carbon sheet steel should be

provided for cooling.

Technical Particulars:
No. of Winding : 2
No. of Phase : 3
Winding connection: primary - Delta
Secondary - Star
Connection Symbol: DYN 11
Rated frequency: 50 Hz
Rated kVA:
Rated primary voltage: 11kV
Short circuit level: 26.2kA
Method system earthling: Solidly earthed
Rated Secondary voltage: 433 V
Impedance voltage: 4%
The temperature rise at reference ambient as per IS: 2026
Top oil 45^{o}C by thermometer method
Winding 55oC by resistance method
Primary and secondary sidecable box forcable
termination.
All standard fittings and accessories as per IS
AcceptablemakesCGL, EMCO, Bharat Bijlee, WSON

5.2 Insulating Oil

The transformer shall be supplied with insulating oil duly filled. The insulating oil shall conform to IS: 335 10% excess oil shall also be supplied to account for loss.

6.3 Transformer Accessories

The transformers shall have the following Accessories

- Off Circuit manual tap changing switch externally operated as specified and positioned on side of transformers accessible from the ground level;
- Conservator with drain plug, filling as specified.

- Explosion vent with diaphragm

- Air-relief vents;

- Inspection cover on the tank covers for all transformers;

- Filtering connections with required valves

- Following valves shall be provided

- Oil sampling valve - One No

- Oil Drain valve - One No

- Filtering valves - Two No s

- Grounding terminals, two for the transformers tank for clamping to purchaser's grounding grid connection;

- Lifting lugs or eyes for the over top part of tanks, cores and coils, and for the complete transformers

- Pulling eyes, for pulling the transformers parallel to and at right angles to the axis of bushings.

- Diagram and rating plate for transformers,

- Rollers

- Thermometer pockets with dial type thermometers for top oil temperature indication. The thermometer shall be clearly visible from ground level as specified.

- Weather proof control cabinet

- Buchholz relay

Transformer shall be tested as per IS 2026.

6 LT Panel Board

Panel board shall be either cubicle type floor mounted or wall mounted. The board shall be Vermei and dust proof powder coated made of 14 SWG MS sheet and MS angle, iron frame work with copper/Aluminum bus bar 4 nos enclosed with insulated sleeves of approved colour and required current carrying capacity as per IE rules. The bus bars shall be mounted on a suitable insulating support. The panel board shall be complete with all internal wiring including twin copper earthing.

7 Air Circuit Breakers

The Air Circuit Breakers shall conform with IEC/Indian standards. The ACBs shall be manually draw out type in open execution with over current trip device adjustable 64% to 110% time setting for overload adjustable current setting for short circuit protection and adjustable current and time setting for earth fault protection.

No. of poles - 4 or 3

Rated insulation voltage – 1000

Rated short circuit breaking	- 50 KA – (AC – 415V)
Rated making capacity AC	- 105KA
Rated short time withstand current	– 50KA
Total making time	- 30 millisecond
Total Breaking time	- 38 ms.
Motorised mechanism	– 220/240V
Under voltage released AC	– 150/(66)VA

Opening line delay	– 20 – 30 MS
System protection	– overload, short circuit, Earthfault
Overload protection 50%to 100%	– adjustable current settings ariation
Short circuit protection	– adjustable pickup level
Earth fault protection	- relay shall have sensitivity of adjustable Between 10% to 30% of ACB rating

Air circuit Breaker shall be fitted with following

- Heavy duty switch having not less than 4 No. + 4 N C - contacts
- Built in resin cast current Transformer
- Auxiliary contacts
- Shunt and under voltage tripping device
- Neutral CT for earth fault protection
- ACB shall be suitable for locking the breaker in various positions.

Provision of door locking with requisite end termination lug and sockets.

Terminal bars for connecting more than one terminal.

8 Moulded case circuit breakers

The Moulded case circuit Breakers shall have overload, and Short-circuit protective elements. The contact system shall be designed to have minimum wear and also energy loss. Arc extinguishing device shall be provided. The MCCB shall have 'ON' – 'OFF' or 'Trip' indicators. The interrupting capacity of the breaker shall be 35KA – 50 KA at 415V. The MCCB shall be tested as per IS 2516.
The container shall be of non-conducting materials and withstand high temperature, and flame retardant.

9 Miniature Circuit Breakers

Miniature circuit breaker working on residual current device having 6000A short circuit breaking capacity and 30 milli amp. sensitivity and 30 millisecond tripping time conforming to IS 12640 trip free mechanism operating for rated leakage at nominal 10 Volts. Earth leakage circuit breaker also may be provided wherever necessary instead of MCB.

10 Fuse Switch Units.

10.1 The fuse switch unit shall be suitable for 415/430V operation and conform to IS 13947 (Part 3) and IEC 947-3.

The switch shall conform to following Technical specification

Rated operational voltage	- 415V
Rated insulation voltage	- 66v
Rated Thermal current	- 125A/160A/250/400A
Number of Poles	- Three (TPN) isolate

Rated operational current - as required

Rated making capacity - 10 times the rated current

Rated fuse short circuit making

capacity at 415V - 176 KA

Rated fuse short circuit withstand

Capacity - 80 KA

10.2 Indicating Instruments

All electrical indicating instruments shall be digital square type of size suitable to the panel. These shall be suitable for flush mounting with only flanges projecting on vertical panel. Instrument dial shall be white with black numerical lettering.

Instrument shall conform to IS 1248 and shall have accuracy class 1.00 or better. The current coil and potential coil of Ammeters and Voltmeters respectively, shall withstand 120% of rated current and voltage, without loss of accuracy.

The meters shall have external zero adjustments. The ammeters fitted in the motor circuits shall have suppressed scale to indicate the maximum starting current. The instrument shall be provided with glass cover to avoid the possibility of measurements due to static charge.

The three phase three wire trivector meter shall comprise of KWH meter and KVAH meter mounted together with KVAH meter in one case with special summator mounted between them to register correct KVAH at all power factors.

All the factors shall have respective maximum demand indicators to record the average power over a period of half an hour. The trivector meter shall conform to relevant IS.

10.3 Under Voltage Relays

The induction disc type, single pole under voltage relay shall have inverse time voltage characteristics on all taps. The relay shall be designed to develop maximum torque at supply frequency and shall be insensitive to the voltage at harmonic frequencies.

The operating time shall be adjustable by time setting multiplier. Selection of the required voltage setting shall be possible by means of a plug setting bridge having an insulated plug. The relay shall conform to IS-3231.

11 Protective Relays

Relays shall be rectangular in shape, flush mounting type, having dust tight covers, removable from front, and shall be equipped with externally reset, positive action operations indicators. The relay shall have auxiliary units of either series connected or shunt connected type. All auxiliary relays shall be non-draw out type and protection relays shall be draught type with test facilities.

Test plug shall be supplied loose. All relays shall conform to the requirements of IS - 323 or relevant IEC in general and IS - 3231 in specific.

Relays shall be provided with adequate number of potential free self reset/hand reset output contacts as required. Provision shall be made for easy isolation of trip circuits of each relays for the purpose of testing and maintenance. Current transformer short circuiting arrangement

shall be provided in case of draught type relays.

Voltage relays shall have sufficient thermal capacity for continuous energisation using external resistance, if necessary.

No control relay, which will trip a circuit breaker when relay is de-energized, shall be used.

12 CABLES

13.1 1100V/660V Grade cables shall be PVC insulated, PVC sheathed, G1 strip armoured, Aluminum conductor as per IS:1554 Part I & II.

The control cables and cables for lighting system shall be with PVC insulated, multi stranded copper conductors. Cables in general shall conform to IS 694/1990, and cross section 25,16, 10, 6, 4, 2.5 and 1.5 sq.mm.

12.2 Laying of cables

- Cables shall be laid directly buried on earth, in conduits along walls, ceiling etc.

The cable installation shall conform relevant ISS.

- Cable inside the Sub-station/Building shall be laid in the prepared trench. If any hole or breaking of wall is required for cable laying work, it shall be done by the contractor and the wall shall be closed after completion of the work as original.
- The cable trench dimensions inside the Sub-station and the route shall be indicated to the civil contractor well in advance while Sub-station civil work is in progress, depending upon the cable entry, and location of different equipments, transformers, panels, etc.

- Laying of underground cables outside the building shall be done by excavating a trench covered by brick and sand of 0.75 metre depth for HT and LT cable and protecting each run of cable by sand and earth filling.

- The HT and LT cables shall be taken through the cable duct provided on the ground floor roof as shown in the sketch, by properly clamping.

- Fixing of cable on the wall by clamping the cable, using suitable GI clamps with wooden saddles. The distance between two clamps shall not be more than 750mm. The cables shall also be taken through PVC pipes on the wall. The cable route on the walls shall be decided with the Engineer in site. The cables shall be covered with GI plates, trays or wooden covering. Sharp bending, twisting and Kinking of cables shall be avoided. Suitable cable duct shall be provided in the wall connecting all switch rooms of Railways and Commercial Complex.

13. Distribution Boards

All the switch Boards, Panels shall be neatly wired using 1100/660V PVC insulated stranded copper cable of minimum 2.5 sq.mm. Copper Bus Bars also may be provided to suit the requirements.

Each wire shall be identified at both ends with cable marker.

Distribution Boards shall be housed in metal clad case or board conforming IS 4237. The Sub-distribution Boards shall be equipped with rigidly fixed miniature circuit breaker complying IS8828 in the phase leads with over load and short circuit protection. The MCBs shall have adequately sized terminals for the outgoing leads. The distribution boards shall

have adequately rated phase and neutral bus bars of high conductivity copper. Earth bus bar with the necessary number of terminals for connecting the earth continuity conductors.

Each SDB shall have circuit schedule pasted or permanently fixed inside the cover stating the details of circuit controller and rating of MCB. Non-flammable insulating shields shall be provided to prevent fire hazards during operation of MCBs.

The Sub-Distribution Boards shall not be mounted at a height exceeding 180CM from ground level.

Main Distribution Boards shall be surface mounted. Main Distribution Boards shall be erected in each switching room, and sub-distribution boards shall be located according to the distribution of load and the equipments to be connected and its location.

14 Lighting System

14.1 Point Wiring

Point wiring shall include all work necessary to complete wiring from switch circuit of any length from the tapping point on the distribution circuit switchboard to the following:

- Ceiling rose for fans, lighting etc.

- Socket outlet (in the case of socket outlet points)

- Lamp holder (in the case of wall brackets, batten points, bulk head and similar fittings).

- Call bell buzzer (in the case of the works “via the ceiling rose/socket outlet or bell push where no ceiling rose/socket outlet is provided”).

14.2 Circuit wiring

Circuit wiring shall mean the length of wiring from the distribution board upto the tapping point of the nearest first points of that circuit, viz., upto the nearest first switchboard measured along the run of wiring. Such wiring shall be measured on linear basis.

15 Electric Motor

Type : Squirrel case induction motor suitable for continuous duty.
Standards : Performance - IS 325, IEC 34
Dimensions - IS 1231, IEC 71
Site condition : Ref. Ambient -45C
Max humidity - 100%

Cast iron body with integral feet and frame. The stator core shall be that of high grade carlite insulated low loss silicon steel lamination stacked together and fully tightened. The rotor shaft made of high grade forged/rolled steel. A spacious terminal box to be provided to accommodate aluminum conductor cables.

Technical Particulars: Rated voltage: 415V+110%

Frequency: 50Hz+3%

Temperature rise of 75oC over ambient of 45oC

Enclosure: IP 55

Type of cooling: Totally enclosed fan

Acceptable makes Siemens, NGEF, CGL, KEC

15.1 Auto transformer starter

Automatic auto transformer starter shall be assembled in 14 SWG sheet steel, floor mounted with following accessories

- Oil immersed auto transformer with 50%, 65% and 80% tapping including first filled oil.
- Bimetallic overload relay
- Timer on delay and off delay.
- Ammeter with CTS and selector switch.
- Voltage with selector switch.
- No voltage release
- Indicating lamp, Power On, Trip (Single phasing current sensing preventor with protection CTS)
- Thermo stat for oil temperature.(Optional)

16 Earthing

- Earthing in general shall comply with C.P.(Code of Practice) 3043 of Indian Standards.

- Earth electrode either in the form of pipe electrode or plate electrode should be provided at all premises for providing earthing system.
- As far as possible, all earth connection shall be visible for inspection and shall be carefully made.

- Except for equipment provided with double installation all the non-circuit carrying metal parts of electrical installation are to be earthed properly. All metal conduit trunking cases. Sheets, switch gears, distribution fuse boards, lighting fittings and all other parts made of metal shall be connected to an effective earth electrode.

- The main earth electrode should be a G.I perforated pipe driven into the soil as per standard practice. continuous looped eathing should be provided with adequate size G.I. wire /feat. Earthing work should conform to I.E. Rules.

- The electrodes shall be situated at a distance not less than 3.0 m from the building fencing structure and equipment foundations. The earth pit shall conform to IS: 3043 and GI earth electrodes of not less than 100 mm external dia shall be driven to a depth of at least 3 ma in the ground below the ground level. The surrounding the electrodes, soil shall be treated up with salt, coke and charcoal.

- Earth electrodes shall be installed near the main supply point and shall comprise a

copper/GI earth of appropriate diameter and driven to depth of 3 metres below ground level,. or to a greater depth, if so required to obtain a sufficiently low earth resistance value. Alternatively copper plate mach be used as the main earth electrode conforming to IS: 3043. The electrodes shall be driven at least 3 m away from the building or any other earth station.

Minimum requirement of earth pits as per I.E. rules are as under:

- Two numbers independent for transformer body
- Two numbers independent for transformer neutral
- Two numbers independent for four pole structure
- One number for lightning arrestors.
- Two numbers of L.T. panel at sub-station and at pump house.

the main earth electrodes after being driven into the ground shall be protected at the top by constructing a concrete or block masonry chamber of size 300 mm x 300 mm x height 300 mm. and shall be provided with CI cover. The resistance of any point in the earth continuity system of the installation to the main earth electrode shall not exceed 1.0 ohm. The remaining space in the borehole shall be filled with bentonite. The bentonite will hold the earth rod in position. The neutral conductor shall be insulated throughout and shall not be connected at any point to the consumers earthing system.

- An earth continuity conductors shall run continuously from the farthest part of installation to the main earth electrode and shall be connected by branch conductor to all metal casing and sheating housing electrical apparatus and/or wires and cables. all branch shall be connected to earthing. The earth continuity conductors shall have a cross-sectional area at least half to the size of the phase conductor and in no case less than 1.5 sq.mm of copper/GS.

- All earth wires and earth continuity conductor shall be galvanized M.S flats of appropriate size. Interconnections of earth continuity main conductors and branch wires shall be brazed properly, ensuring reliable,. Permanent and good electrical connections. The earth lead run on structures must be securely bolted. Neutral earth leads shall be run on separate supports without touching the body of the transformers. Earth wires shall be protected against mechanical damage and possibility of corrosion particularly at the junction points of earth electrodes and earth wire interconnections. Earth electrodes shall be connected to the earth conductors using proper clamps and bolt links.

- It shall not be allowed to use the armour of the incoming feeders cable to the sub-distribution board as the only earthing system.

- Sheathed lugs of ample capacities and size shall be used for all underground conductors for sizes above 3 mm2 whenever they are to be fitted on equipment of flat copper conductor.

- The lugs shall be fitted on equipment body to be grounded or flat copper only after the portion on which it is to be fixed is scrubbed, cleaned of paint or any oily substance on a subsequently tinned.

- No strands shall be allowed to be cut in case of stranded ground round conductors. G.I embedded conduits shall be made eclectically continues means of good continuity fixing and also be rounding copper wires and approved copper clamps.

16.1 Earthing of Lighting Poles

All external poles are to be looped together with continues 8 SWG GI earth wire clamped at dollies provided on every fuse box of poles and looped onwards to the other pole. Every fifth pole shall be connected to earth through an earth electrode.

16.2 Earthing for Lighting Installation

This shall be common grid system, the main grounding conductor laid and embedded in concrete being grounded at earth pits outside the buildings at approved locations or other places. The earthing of L.T. panels shall be connected to two main grounding conductors each of which along with main cables shall run with cables to distribution boards in which floor. This shall run along with th4 cable and at the top floor be connected same section completing the grid.

16.3 Sizes of Earthing Conductors

S No	System	Earthing conductor size and Material Buried in ground/ Above ground concrete	
-	Main earthing grid	40 X 10 mm MS	---------
	11 kV outdoor sub-station switchgear	40 X 10 mm MS	50 X 6 mm GS and 11 kV
-	415 V switchgear, transformer, DG set,	suitable to its	Suitable to its rating. Capacitor Control Panel
-	Battery charger		-25 X 3 mm GS
-	415 VLT Motors		
-	Valve motors	10	SWG GS wire
-	0 - 15 HP	8	SWG GS wire
-	15 - 40 HP	4	SWG GS wire
-	40 - 50HP	25 X3 mm GS flat	
-	50 HP and above	25 X6 mm GS flat	
-	Lighting distribution Board, Tripping Unit.	25 X 3 mm GS flat	30 V DC
-	Local Push Button stations,	14 SWG GS wire	Junction Boxes.
-	Lighting and receptacle system	12 SWG GS wire	
-	earth Electrode	50 mm dia. 3000 mm long heavy duty GI Pipe electrode	
-	Street lighting Poles	8 SWG GS wire	

Notes: 1. Conductors above ground shall be galvanized steel to prevent atmospheric corrosion.

2. Conductors buried in ground or embedded in concrete

shall be mild steel.

16.4 Battery, Battery Charger & DC Distribution Board

-The charger and DC distribution board shall be enclosed on a common sheet steel enclosure with necessary compartment for each incoming and outgoing feeder.

- Complete information regarding battery layout, space requirement for locating battery, wall painting of battery room floor, ventilation, method of lighting etc. shall be supplied by the Contractor. The battery room shall preferably be located inside MCC room as shown,. The battery room shall have acid proof tiles as flooring and upto 4 ft. level. Also there shall be an exhaust fan of appropriate capacity to extract vapours from the room.

16.5 Tests

- Batteries and battery chargers shall be routine tested before despatch,in accordance with Indian Standards. Capacity test shall be carried out on the batteries at site after installation.

17. Street Light

Street Light fixtures shall be complete with integral semi-cut off lantern with glass cover complete with internal wiring, control gear, mounting accessories, street light bracket for HPSV 150W made from 60mm dia (B Class G I Pipe) 2 m in length and welded to the pole cap of size 100mm and 30 cm long duly welded.

18. Street Light Poles

The street light mast shall be 65m/75 diameter G.I pipe of 7.5 meter long with 300mm x 300mm x 6mm of M.S base plate, duly welded at the bottom. A suitable MS box to have 5A control switch, 16A fuse unit with suitable frame work shall be fitted in the street light mast with door and locking arrangements.

A terminal box with fuse shall be fixed in all the poles.

19. Capacitor

To improve the power factor capacitor shall be provided in the LT bus bar in the sub station.

- The capacitor shall be as per ISS 2834 and IS 2544.
- The capacitor shall be all polypropylene film capacitors. The film shall be oriented bi-axially.
- The oil used for impregnation under vacuum shall highly purified non- toxic.
- Low loss discharge resistance, to reduce the residual voltage to 50V or less within one minute after the capacitor is disconnected.
- The capacitor container shall be painted with epoxy-based paint, to prevent corrosion/rusting.
- 4 stage switching ON/OFF shall be provided to match with the load.
- Automatic Power Factor Correction Unit shall be provided if

necessary.

20. Safety

The following minimum safety equipments shall be supplied and installed in the Sub-Station switch rooms and Diesel Generating rooms.

- Portable chemical fire extinguishers conforming to IS 935 or its latest version shall be supplied and installed at the Sub-Station, Switch rooms and Diesel Generating Stations.
- Fire buckets with M.S. angle stand each consisting of 4 Nos. round bottom fire buckets painted with red and marked fire and filled with clear dry river sand shall be supplied and installed at a convenient locations at the proposed Sub-Station.

- First-Aid boxes equipped fully with required materials, shall be supplied and kept at a convenient place in the Switchgear room so that the same is easily accessible.

- Shock Treatment chart.

- Rubber matting of not less than 25 mm. thick and 600 mm width and standard lengths, shall be provided in from of all the switch gear panel, Transformer, Control cubicles, etc.

- Rubber gloves tested for 15 KV about 4 sets shall be supplied.

21. Diesel Generating Equipment

21.1 General

- Electrical power supply for each pumping station will be availed from nearby RELIANCE ENERGY supply point. According to the load requirement HT at 11KV/22KV or LT at 415V - 3 Phase will be availed from RELIANCE ENERGY.

- One Diesel driven alternator set of capacity as specified shall be provided to permit operation of the Pumping Station in the event of failure of the RELIANCE ENERGY electricity supply, complete with all equipments like. The equipment shall conform to the latest relevant ISS or BS.

- Control gear, circuit breakers, cabling, synchronising equipment etc.

- The engine alternator sets shall be designed such that the starting power peak shall not exceed 10 per cent of the continuous engine rating and the voltage dip shall not exceed 15 per cent whilst starting the connected load under the worst conditions.

- The Contract Drawings show the building, floors and other details as they will be constructed and the space allocated for the generating plant, control gear and circuit breakers. If any departures from the proposed layout are necessary the Contractor shall show the modifications on the drawings submitted with his Tender, and shall can attention to these suggested alterations.

- Tenderers attention is specifically drawn to the operating conditions where by generator sets could be running at little or no load due to the intermittent and differing flow rates and pump capacities.

- A system using dummy loads to maintain a safe minimum working level is envisaged and the Tenderer is required to comment upon this or any other proposed system at the time of Tender submission together with supporting

documentation and calculations.

22 Statutory Approval

The Contractor shall be totally responsible for obtaining statutory approval from the electrical inspector or any other statutory authority for the entire installation carried out by him unless otherwise specified and agreed. Necessary test reports shall be submitted by him to electrical inspector. This will be an integral part of the contract and shall not be paid for separately. However fees payable to statutory authorities shall be borne by the tenderer.

23 Acceptance of Installation

On completion of the work the Engineer, together with the Contractor, will carry out an inspecting of the installing. The Engineer will issue a completed copy of the Purchaser's Acceptance of Electrical Installation to the Contractor as confirmation that the work has been accepted, subject to any matters noted on the form being attended to.