Islamic Republic of Iran
Vice Presidency for Strategic Planning and Supervision

General Technical Specification and Execution Procedures for Transmission and Subtransmission Networks LVAC Systems

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Technical Specification
LVAC Systems

1. GENERAL REQUIREMENTS

This specification covers the requirements for the design, manufacturing, factory testing, marking and packing of LVAC system and accessories.

The low voltage ac system shall comprise of indoor main and distribution boards, outdoor distribution boards, lighting boards and aux. transformers board. The essential section of main switchboard shall be fed from a busbar and nonessential section from other busbar. These busbars shall be interconnected by a section breaker.

In addition to the above, the essential section shall be fed from standby diesel generator source or independent 400 V supply from outside of substation for supplying essential loads in the event of complete loss of both ac sources.

In principle, entire loads shall be supplied with one auxiliary transformer and another transformer- if exists- is spare.

All identical equipment and corresponding parts shall be fully interchangeable, without having to carry out modifications.

The complete selection scheme shall have both automatic and manual changeovers.

The outdoor and indoor distribution and lighting boards shall receive power from essential and nonessential sections of LVAC switchboard and distribute the AC supply in respective area.

The auxiliary transformers and diesel generator are not the scope of this specification.

The LVAC system shall be designed, manufactured and tested according to the applicable requirements of the latest edition of the following standards and to this specification:

IEC 60051: Direct acting indicating analogue electrical measuring instruments and their accessories.

IEC 60073: Coding of indicating devices and actuators by and supplementary means.

IEC 600129: Alternative current disconnectors and earthing switches.

IEC 60144: Degrees of protection of enclosures for low voltage switchgear and controlgear.

IEC 60158: Low voltage controlgear.

IEC 60044-1: Current transformers.

IEC 60189: Low frequency cables and wires with PVC insulation & PVC sheath.

IEC 60227: PVC insulated cables of rated voltage up to and including 450/750 V.

IEC 60255: Electrical relays.

IEC 60269: Low voltage fuses.

IEC 60355: Safety in house hold & similar electrical appliances.

IEC 60387: Symbols for alternative current contactors.

IEC 60726: Dry type power transformers.

IEC 60730: Automatic electrical control for house hold and similar use.

IEC 60947: Low voltage switchgear & controlgear.

BS 89: Electrical indicating instruments.

BS 142: Electrical protective relays.

BS 158: Marking and arrangement of switchgear busbars, main connections and small wiring.

BS 159: Busbar and busbar connection.

BS 162: Electric power switchgear and associated apparatus.

BS 381 C: Colours for specific purposes.

BS 775: Contactors for voltage upto and including 1000 volts ac and 1200 volts dc. (part 1)

BS 861: Air break switches and isolators.

BS 3185: Heavy duty composite units of air break switches and fuses for voltages not exceeding 660 volts.

BS 60898: Circuit – breakers for overcurrent protection.

BS 3938: Current transformer

BS 3941: Voltage transformer

BS 4099: Colours and their meaning when used for indicating lights annunciators and digital readout in industrial installations.

BS 6231: PVC insulated cables for switchgear and controlgear wiring.

Basic equipment data and rating shall be as specified in schedule LVAC (I).

2. TECHNICAL SPECIFICATION FOR PANELS

All boards shall be of metal clad design and protected as specified. The main switchboard shall be of drawout design and the distribution boards, aux. transformer boards, diesel generator board and lighting boards shall be of non-drawout design.

The boards shall be metal enclosed, floor mounted, modular type, rigid, self supporting, free from vibration, twist and bends, and suitable for indoor or outdoor use as specified. Also, panel doors should not be opened over specified range. The opening range of panel doors shall be adjustable.

The boards shall be of dust, moisture and vermin proof construction and provided with gaskets all round the perimeter of covers, gland plates and doors to provide specified degree of protection, and shall be provided with labels on front and near indicating the switchgear and feeder designation.

The individual compartment doors shall be provided with suitable cutouts as necessary to permit control of circuit breakers from the front without having to open the compartment door. Such cutouts shall be provided with spring loaded gaskets for the purpose of dust and vermin proofing.

The boards shall be fabricated using suitable mild steel structural sections or pressed and shaped cold rolled sheet.

Each board shall be fabricated with a material resists against bending and shall be designed in such a way that during opening, it shall not be exposed to vibration.

Type test reports for draw-out boards shall be submitted.

After isolation of the power and control connections of a circuit it shall be possible to safely carry out maintenance in a compartment adjacent to busbars and circuits.

Mimic diagram similar to referred drawing shall be provided in front of board.

Each board shall be equipped with thermostatically controlled space heater, inner lighting lamp, circuit isolating and selector switches, push buttons, indicating instruments, lamps and protective relays mounted on the front doors.

Inner board temperature shall not exceed from specified range, heat generating devices shall be mounted on adjacent surface. In addition inside board, sensitive and electronic devices shall be placed on a position for from heat.

Installation place of circuit breakers, contactors and etc. shall not be closed together to facilitate dissipation of produced heat. Also equipments and busbar carrying current shall not closed together, to reduce possibility of short-circuiting in addition to above reason.

At warm places polluted with dust, if higher protection degree is required, it's better for boards to be equipped with ventilation system prepared by filter.

Circuit breakers of LVAC system shall be observable through glass doors.

The boards shall be provided with busbar (phases, neutral and earth) elongated along the length of the switchgear and easily be extendable on both sides by addition of vertical sections after removing the end covers.

3. PROTECTION TYPE AND FEEDER CONTROL

All main panel feeders, lighting panel feeders and distribution feeders shall be controlled by MCCB's. ACB can also be used for controlling of input feeders of main panel. MCB's can be used for output feeders.

In the auxiliary transformer panel, a three phase feeder with switch - fuse and supply plug for oil treatment shall be installed. Electrical energy required for oil treatment of transformer shall be supplied from another transformer.

4. BUSBARS

The boards shall be provided with 3 phase, neutral and earth busbars. Busbars and all their joints and parts shall withstand rated current continuously and specified short circuit current for mentioned period in accordance to site conditions.

Busbars shall be of uniform cross section throughout the length of the switchgear and up to the incoming terminals of feeder circuit breaker.

Busbars shall be made of copper and shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents for the associated switchgear.

Busbars shall be PVC sleeved and bus taps and joints shall be PVC shrouded. Busbar supports shall be made of insulator materials or special moulded plastic material with electrical and mechanical withstand. Separate supports shall be provided for busbar of each phase. If a common support is provided for the busbars, antitracking barriers shall be provided.

Busbar joints shall be of the bolted type and busbars shall be thoroughly cleaned galvanized at the joint locations and a suitable contact grease shall be applied just before making a joint.

Covered colour of busbars shall be enamel. Cut-out sections of busbars shall be rasped and their edges shall be soft and without sharpness.

Earth busbar shall be placed where a possibility of treading does not exist. It must be blade-like.

5. AIR CIRCUIT BREAKERS

The ACB shall be horizontal drawout, shunt trip, and trip free type. The ACB shall be provided with motor wound spring charged type operating mechanism, antipumping feature and with mechanically operated " Trip" pushbutton (red) and " Close " pushbutton (Green).

Close PB shall be provided with pad locking facilities in the "fully engaged, "test" and "isolated" position.

The ACB shall be provided with 6 NO + 6 NC contacts for external interlocks, green, red and amber indicating lamps to show closed, open and autotrip conditions of the CB. Also indication lamp for internal test condition shall be mounted on the circuit breaker.

Automatic shutters to prevent accidental contacts of live parts when the CB is in drawn or service position shall be provided.

The circuit breakers shall be provided with the following interlocks:

- It shall not be possible to operate a circuit breaker unless it is in fully plugged or fully isolated position.

- It shall not be possible to plug in or to drawout a closed circuit breaker.
- The Circuit breaker shall be connected to earth during drawout and vice versa.
- The CB close and trip coils shall be rated for satisfactory operation on a specified control supply system voltage.
- A supervision alarm feature shall be provided on each CB in open or closed position.
- The auxiliary relays of individual breakers shall have operation indicators.
- Circuit breakers shall be of stored energy type. The storing of energy shall be manual and electric.
- Manually operated mechanism shall be of the spring charging stored energy type.
- Power operated mechanism shall be of the motor wound spring charged stored energy type.
- The closing action of the CB shall charge the tripping spring ready for tripping.
- All stored energy mechanism shall be provided with mechanical indicators to show the "charged and "discharged" conditions of the spring.

The design of the operating mechanism shall be such that:

- The CB shall not close unless the spring is fully charged.
- Shocks, vibrations or failure of springs shall not operate the breaker or prevent intended tripping.
- Power operated mechanism shall be provided with a dc motor suitable for operation on specified dc voltage.

Mechanism shall be designed to enable a continuous sequence of closing and opening operation as long as power is available and at least one opening operation on power supply failure, and provided with emergency manual charging facilities.

For control and autochangeover schemes, facilities for remote closing and opening of CB should be provided.

The spring charging time for the power operated mechanism shall not exceed guaranteed time or 20 seconds whichever is lower.

Power operating mechanism shall be provided with following additional features:

- Closing of the CB shall automatically initiate recharging, ready for next closing action.
- The motor supply shall be removed as soon as emergency manual charging handle is coupled.
- The circuit breaker mechanism shall make one complete closing operation once the control switch has been operated and even though the control switch is release before the closing operation is complete.
- Closing controls shall be so arranged that only one closing operation of CB shall result from each close initiating impulse.

An antipumping relay shall be provided on the CB.

6. MOULDED CASE CIRCUIT BREAKERS (MCCB)

MCCB's shall have single units of triple pole construction. All live parts shall be totally enclosed in a heat resistant moulded insulating material housing. The operating mechanism shall be quick make, break and trip free type. MCCB's shall have inverse time - current characteristics for sustained/ periodic overloads.

MCCB's shall be designed in such a way that until their power is supplied them, they are capable of making and breaking continuously. By interrupting in supply they must be minimally capable of once trip and they shall be capable of manual operation in emergency cases.

Alarm accessories shall be provided in both opening and closing cases.

For output feeders, MCCB's shall be of "plug-in" type. (only C.B can be withdrawn and feeder shall not have this capability).

MCCB's shall have the following features:

- Instantaneous tripping on short circuit.
- Simultaneous tripping of all poles.
- Mechanical position indicator.
- Shrouded terminals.
- Auxiliary contacts for alarms.
- Rating of 660 V AC.
- The breaking capacity of the MCCB shall be rated for short circuit levels as specified.
- The maximum tripping time under short circuit conditions shall not exceed 25 milliseconds for instantaneous tripping characteristics.
- Instantaneous tripping at 800% to 1000% of setting.
- Under voltage relays.

7. LIGHTING FEEDERS

These shall be MCB - Contactor operated. The contactors shall be closed and opened manually in manual mode of the selector switch (Auto, Man, off) and automatically in auto mode of the selector switch by sets of photo switches.

The photo sensitive controllers shall be industrial grade type generally used for control of street lighting with contact output of 10 amps at 230 V AC.

The contact output of these switches shall be used to trigger one or series of power contactor which will switch On and Off the lighting feeders.

Two photo switches will be located outside and one number inside. The outdoor type photo switches shall be provided with continuously variable setting control. The control shall be adjusted to turn the lights ON over a range of 0.88 to 8.8 luxes.

Above devices shall be suitable for outdoor application with degree of protection IP54 or IP55 and antisnow deposit barriers shall be provided.

The photo switches shall be provided with 2 to 20 seconds delay at the turn off to prevent false operation of control due to transient lights.

Contactors shall be of the electromagnetic air break type. Each contactor shall be provided with 2NO+lNC auxiliary contacts .

Operating coils of contactors shall be suitable for operation on 230 V AC, single phase 50 Hz.

A test push button switch shall be fitted inside each section such that operation of the contactor can be tested with the front door open.

Contactors shall operate quite satisfactorily for duration of 5 minutes when the supply voltage falls below 70% of the normal value.

8. RELAYS

8.1. Short circuit protection relay

These relays shall be coordinated with upstream and downstream protections. These relays shall be applied on incoming, bus section, aux. transformers secondary and diesel generator circuit breakers (or C.B of 400 V separate supply – if exists-) and they shall measure current from adequately rated CT secondaries.

This relay shall be 3 phase type and shall have two self reset NO contacts and be suitable for specified control supply.

8.2. Neutral and voltage restrained over current relays

Voltage restrained over current relay shall be applied on diesel generator incoming or independent supply feeder and mounted on main switchboard instead of O/C relays. The relay shall be supplied from adequately rated CT secondaries located in the incoming feeder.

The relay shall be 3 phase type and shall have IDMT characteristics on fault and inverse time characteristics on overloading of the feeder. Therefore it shall protect the feeder from overloads and short circuits.

Voltage restrained coil shall be suitable for 110 volts voltage (Ph-Ph). It's current setting and time multiplier ranges shall be suitable for correct operation. The relay shall have two sets of self reset NO contacts and shall be suitable for upstream and downstream protections.

The neutral O/C relay with inverse characteristics should be considered on diesel generator board. This relay will be supplied from diesel generator neutral current transformer with one amp. secondary. The relay should have two sets of self reset NO contact.

8.3. Under voltage relays

The relays shall be 3 phase type and after an adjustable time delay of 2-10 seconds shall trip the respective incoming breakers and start the chain of auto changeover sequence including closing of standby supply CB or starting diesel generator and closing of its incoming supply etc.

8.4. Lockout relays

Hand reset type relays with adequate NO+NC contacts shall be used for each air circuit breaker to trip CB and block their closing unless reset by hand.

The relays shall be suitable for specified supply and be mounted built-in.

8.5. Auxiliary relays

These auxiliary relays shall preferably be located in the respective distribution boards. If these cannot be accommodate in switch boards, for mounting them near respective switchboards, separate panel shall be provided.

9. INDICATORS AND METERS

Each incoming feeder shall have an ammeter and each busbar section shall have a voltmeter with respective selector switches. Indicating instruments shall be mounted built-in on the panel with only flanges be visible.

Ammeters shall be connected through suitable current transformers. Ammeter selector switches shall be of the make - before - break type so as to prevent open circuiting of CT secondaries when changing the position of the switch.

Voltmeters shall be protected with HRC fuses.

The voltage of essential and non essential busbars and current of each incoming feeder should be provided for mimic control panel by transducers.

10. INTERLOCKINGS

All interlocks provided throughout the switchboard shall be of preventive rather than corrective type; i.e. an attempt to isolate a closed CB shall not result in tripping of the CB.

It shall be possible to operate independently each set of shutters such that either can be padlocked whilst the other is open for earthing and maintenance purposes.

All manual and autochangeover shall take place after confirmation that all CB's feeding the busbar are open (bus is dead) such that no momentary paralleling is possible between two or more sources.

11. WELDING SOCKET

Welding sockets shall be provided with specified rating , four pin, fused and switched outlets. They shall be metalclad and water tight to IP54 level and shall be suitable for welding and portable pumping equipment.

Outlets shall be located in the switchyard AC distribution boards. The sockets shall be wall mounted with bolted on front cover and removable gland plates.

Each welding socket shall be fitted with an earth stud, located in an accessible position on the outside of the body. All metal parts of the socket except current carrying parts, shall be bonded together electrically and to the earth stud.

12. CURRENT TRANSFORMERS

Current transformers shall be of the dry type. The current transformer shall have a short time withstand rating equal to the short time withstand rating of the associated boards.

Separate current transformers shall be provided for metering and protection.

It shall be the responsibility of the contractor to ensure that the current transformer burden, saturation factor, etc. are adequate for the relays and meters connected. The accuracy class for metering CT's shall be 1.0 and 5P for protection CT's.

13. AUTOMATIC TRANSFER SCHEME

The main LVAC switchborad shall be provided with time delayed automatic transfer schemes through two respective auto-manual selector switches. At one time, the main switchboard, both subsections essential and nonessential, shall be served from one substation auxiliary transformer with the other transformer as an alternative supply. By auto changeover scheme, it shall be possible to choose one transformer as the preferred source and other as standby source by switch.

Upon failure or continuous lowering voltage of the preferred source supply , automatic changeover to alternative source shall take place . This changeover shall be initiated after adequate time delay to avoid any unwanted auto-changeovers due to transient and short time voltage dips (70% for 30 sec).

The autochangeover scheme shall close the independent supply feeder CB (if the supply voltage is in the rated value) or start up of emergency diesel generator and transfer the essential section of LVAC board to the independent supply or diesel generator source, upon the loss of both normal and alternative sources of power supply. The diesel generator circuit breaker shall not be closed unless both voltage and frequency of the diesel generator is 1.0 pu of the rated value.

The voltage and frequency of diesel generator shall be measured by voltage and speed relay (VSR) which should be installed on diesel generator board.

By scheme the diesel generator source/independent supply should be connected to nonessential service section of LVAC board, at operator's option to facilitate manual energization of nonessential section of LVAC board, by using of bus section circuit breaker.

None of the automatic and manual transfers shall take place if the respective incoming circuit breakers have tripped from their protections (i.e .due to bus fault and back up trippings etc.).

14. TESTS

All type, routine and special tests stipulated in IEC 60158-1 and IEC 60947 should be performed .

These tests are as follows:

14.1. Type tests

- Temperature-rise limit
- Dielectric properties
- Rated making and breaking capacities
- Rated short time withstand current
- Rated fuse short circuit current
- Rated shortcircuit making capacity
- Mechanical endurance
- Electrical endurance

14.2 Routine tests

- Mechanical operation
- Calibration of relays
- Dielectric withstand

14.3 Special tests

- Electrical endurance

15. DRAWING AND DOUCUMENTS

15.1. Documents to be given by tenderer

- filled schedule LVAC (II)
- Catalogue and technical pamphlets
- Summary of type test reports
- Reference list
- Outline drawing
- Detailed summary of exceptions to tender specifications
- List of special tools
- List of spare parts

15.2. Documents to be given by contractor / supplier

The electrical and mechanical design, fabrication, factory testing, marking, packing, transportation, warehousing, erecting, site tests, operation and maintenance documents and manuals of LVAC system shall be submitted not limited to the following :

- Calculation sheets to establish adequacy of protection and rating of equipment in any respects
- Outline dimension including components, arrangements and terminals
- Relays coordination table
- Name plate drawings
- Packing details
- Routine test certificates
- Site test instruction manuals
- Shipping, warehousing, assembly, erection. commissioning, operating and maintenance instruction manuals.
- Type test documents
- List of components

- Work schedules and monthly progress report
- Drawing list
- Final as built Doc./Dwg.
- Dismantling, reassembling and adjusting manuals.

SCHEDULE LVAC (I)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
1	**Particulars of system**		
1.1	Nominal LVAC system voltage	V(rms)	230/400 V
1.2	Nominal system frequency	Hz	50
1.3	Number of phases		3
1.4	System neutral earthing		Solidly earthed
1.5	Short circuit level	kA	*
1.6	Max. permissible voltage variations	%	-20,+10
1.7	Capacity of auxiliary transformers	kVA	*
1.8	Input and output connection type with cable		
2	**Service condition**		
2.1	Max. ambient temperature	°C	40/45/50/55
2.2	Min. ambient temperature	°C	-40/-35/-25
2.3	Average value of daily temperature	°C	*
2.4	Solar radiation	w/m^2	*
2.5	Altitude above sea level	m	1000/1500/2000/2500
2.6	Pollution level		Low/medium/high/very high/special
2.7	Max. wind velocity	m/s	30/40/45
2.8	Wind velocity at ice condition	m/s	20
2.9	Ice coating thickness	mm	5/10/20/25
2.10	Seismic acceleration	m/s^2	0.2g/0.25g/0.3g/0.35g
2.11	Relative humidity	%	90/95/more than 95

SCHEDULE LVAC (I)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
3	**LVAC main switch board**		
3.1	Rated voltage	V	400/230
3.2	No. of phase and wire	Phase/wire	3/4
3.3	Location		Indoor
3.4	Type of mounting		Floor
3.5	Finishing colour:		
3.5.1	Outside		RAL 7035
3.5.2	Inside		Enamel white
3.6	Short time withstand rating of busbar	kA/sec	*/1
3.7	Continuous rating of main buses, incomings and CB's	A	*
3.8	Fully drawout/ semidrawout/ fixed type		Fully drawout
3.9	Type of CB for incoming and bus section		ACB/MCCB
3.10	Type of outgoing feeders		MCB,MCCB
3.11	Details of incoming and bus section circuit breakers:		
3.11.1	Number of poles		3/4
3.11.2	Type of operation		Motorized
3.11.3	Rated breaking capacity	kA	*
3.11.4	Type of releases		Overload and overcurrent
3.11.5	Number of aux. contacts	NO/NC	2/2
3.11.6	Max. breaking time for fault condition	msec	25
3.12	Protection degree		*
3.13	Padlocking facility is required	Yes/No	Yes

SCHEDULE LVAC (I)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
4	**LVAC distribution boards**		
4.1	Rated voltage	V	400/230
4.2	Location		Outdoor/indoor
4.3	Type of mounting		*
4.4	Finishing colour:		
4.4.1	Outside (indoor board/ outdoor board)		RAL 7035/ RAL 7038
4.4.2	Inside		Enamel white
4.5	Busbar type and material		Triple pole, neutral, earth, copper
4.6	Short time withstand rating of busbar	kA/sec	*/1
4.7	Continuous rating of busbars	A	*
4.8	Fully drawout/ semi drawout/ fixed		Fixed
4.9	Type of incoming feeder		MCB,MCCB
4.10	Rating of incoming feeder:	A	Acc. to Drawing
4.10.1	Indoor boards		Acc. to Drawing
4.10.2	Outdoor boards		
4.11	Type of outgoing feeders		MCCB
4.12	Number and rating of outgoing feeders:		Acc. to Drawing
4.12.1	Indoor boards		Acc. to Drawing
4.12.2	Outdoor boards		
4.13	Rating of welding socket	A	*
4.14	Padlocking facility is required?	Yes/No	Yes
4.15	Is back access required?	Yes/No	Yes

SCHEDULE LVAC (I)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
5	**Lighting board**		
5.1	Rated voltage	V	400/230
5.2	Location		Indoor
5.3	Type of mounting		Wall/Floor
5.4	Finishing colour:		
5.4.1	Outside		RAL 7035
5.4.2	Inside		Enamel white
5.5	Busbar type and material		Triple pole and neutral, copper
5.6	Short time withstand rating of busbar	kA/sec	*/1
5.7	Continuous rating of busbar and CB	A	*
5.8	Number and rating of outgoing feeders:		
5.8.1	Indoor lighting	A	*
5.8.2	Outdoor lighting	A	*
5.9	Padlocking facility is required?	Yes/No	Yes

* These will be specified by engineer.

SCHEDULE LVAC (II)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
1	**Particulars of system**		
1.1	Nominal LVAC system voltage	V(rms)	
1.2	Nominal system frequency	Hz	
1.3	Number of phases		
1.4	System neutral earthing		
1.5	Short circuit level	kA	
1.6	Max. permissible voltage variations	%	
1.7	Capacity of auxiliary transformers	kVA	
1.8	Input and output connection type		
2	**Service condition**		
2.1	Max. ambient temperature	°C	
2.2	Min. ambient temperature	°C	
2.3	Average value of daily temperature	°C	
2.4	Solar radiation	w/m^2	
2.5	Altitude above sea level	m	
2.6	Pollution level		
2.7	Max. wind velocity	m/s	
2.8	Wind velocity at ice condition	m/s	
2.9	Ice coating thickness	mm	
2.10	Seismic acceleration	m/s^2	
2.11	Relative humidity	%	
3	**LVAC main switch board**		
3.1	Applicable standards		
3.2	Type designation		
3.3	Manufacturer		
3.4	Rated frequency	Hz	
3.5	Rated voltage	V	
3.6	Degree of protection		
3.7	Quantity		
3.8	Normal current rating of busbars (site conditions)	A	

SCHEDULE LVAC (II)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
3.9	Short time current withstand of busbars, feeder connections and CB's	kA/sec	
3.10	Dynamic current withstand of busbars	kA	
3.11	Type of CB:		
3.11.1	Incoming		
3.11.2	Bus section		
3.12	Rating of CB:		
3.12.1	Incoming	A	
3.12.2	Bus section	A	
3.13	Breaking capacity of CB:		
3.13.1	Incoming	kA	
3.13.2	Bus section	kA	
3.14	Method of earthing incoming supply circuit		
3.15	Type of protections provided within cubicles		
3.16	Type of the switchboard (fixed, semi drawout/ fully drawout)		
3.17	Details of moulded case circuit breakers:		
3.17.1	Applicable standard		
3.17.2	Type designation		
3.17.3	Manufacturer		
3.17.4	Rated breaking current	kA	
3.17.5	Number of auxiliary contacts (NO/NC)		
3.17.6	Shunt release coil provided	Yes/no	
3.17.7	Under voltage release provided	Yes/no	
3.17.8	Instantaneous trip provided	Yes/no	
3.17.9	Over load protection provided	Yes/no	
3.17.10	Max breaking time for fault condition	msec	
3.18	Overall dimensions L×W×H	mm	

SCHEDULE LVAC (II)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
4	**LVAC distribution board**		
4.1	Applicable standard		
4.2	Type designation		
4.3	Manufacturer		
4.4	Rated frequency	Hz	
4.5	Rated voltage	V	
4.6	Degree of protection		
4.7	Quantity:		
4.7.1	Indoor		
4.7.2	Outdoor		
4.8	Normal current rating of busbars (site conditions)	A	
4.9	Short time current withstand of busbars and feeder connections	kA/sec	
4.10	Dynamic current withstand of busbars	kA	
4.11	Type of incoming		
4.12	Rating of incoming:		
4.12.1	Indoor boards	A	
4.12.2	Outdoor boards	A	
4.13	Number of outgoing feeders:		
4.13.1	Indoor boards		
4.13.2	Outdoor boards		
4.14	Rating of outgoing feeders:		
4.14.1	Indoor boards	A	
4.14.2	Outdoor boards	A	
4.15	Type of outgoing feeders		
4.16	Breaking capacity of outgoing feeders	kA	
4.17	Method of earthing incoming supply circuit		
4.18	Type of the switchboard (fixed/ semi drawout/ fully drawout)		
4.19	Overall dimensions L×W×H	mm	

SCHEDULE LVAC (II)
RATINGS AND CHARACTERISTICS OF LVAC SYSTEM
(LOW VOLTAGE AC)

ITEM	DESCRIPTION		TECHNICAL PARTICULARS
5	**Lighting board**		
5.1	Applicable standard		
5.2	Type designation		
5.3	Manufacturer		
5.4	Rated frequency	Hz	
5.5	Rated voltage	V	
5.6	Degree of protection		
5.7	Short time current rating	kA/sec	
5.8	Dynamic withstand current	kA	
5.9	Type of incoming circuit breaker		
5.10	Type of outgoing feeders		
5.11	Rating of outgoing feeders	A	
5.12	Number of outgoing feeders:		
5.12.1	Indoor lighting		
5.12.2	Outdoor lighting		