PROJECT INFORMATION & AUXILIARY FACILITIES

1	Purchaser	Institute For Plasma Research, Village Bhat, Gandhinagar - 382 428, Gujarat, INDIA. Phone : (079)-23962000 Fax : (079)-23969017 Web: www.ipr.res.in
2	Site elevation (avg.)	55 meters above MSL
3	Ambient temperature	Max.(annual):47 °C; Min. (annual): 4 °C; Average (annual): 35 °C Design (max): 50°C, (min): 4°C
4	Relative humidity	Max. : 95%; Min. : 10%
5	Rainfall	823 mm average (annual) June-August
6	Wind data	Max. wind speed : 130 km/h Prevailing direction : SW to W Design wind pressure : 150 kgm^{-2}
7	Seismic data	0.08 g (as per latest guidelines)
8	Accessibility by road : by rail : by sea : by air :	 upto site(on Hansol-Gandhinagar H-way) Ahmedabad Rly. Stn. (12 km.) Bombay Harbour (525 km.) Ahmedabad Airport (6 km.)
9	Auxiliary power supply (each of the voltages can be made available at one point of connection to the sources)	DC 220 ± 10% V, 2 wire, floating
10	Expected date of delivery	3 months from the date of approval of drawings
11	Expected date of installation & commissioning	1 month after delivery of material at IPR site and after the site clearance given by IPR
12	Guarantee/Warranty	12 months from the date of final acceptance

SPECIFICATION FOR L.T. CIRCUIT BREAKER PANELS

1.1 SCOPE:

The scope covers design, fabrication, inspection, testing, supply, installation and commissioning of L.T. AC cubical pattern Circuit Breaker panels, with all accessories, as specified in this document and in the tender drawings.

1.2 CODES AND STANDARDS:

The design, materials, construction, manufacture, inspection, testing and performance of L.T. Breaker Panel shall comply with all currently applicable statutory regulation and safety codes in the locality where the equipment will be installed. The equipment shall also confirm to the latest applicable standards and codes of practice. Some of the reference standards are mentioned in this tender document.

1.3 DESIGN FEATURES:

a) The L.T. Breaker panels are required for distributing power to various system and utilities.
b) The breaker panel shall be suitable for use in rated voltage of 415V earthed electrical system having maximum system voltage of 415V+/-10%.
c) The design and construction of the panel shall be strong enough to take the load of breaker, bus bars, cables, relays instruments etc. and withstand rated maximum fault level and rigorous adverse weather conditions. Provision shall be made for expansion and contraction of enclosure due to temperature.
d) The breaker, bus bars, cables etc. shall be suitable for continuous operation under site conditions indicated elsewhere with conductor temperature of 105 °C maximum. Also the conductor temperature during short circuit shall not exceed 250 °C. Bus bars shall be suitable for short time overloads.
e) The panel shall be 100% insulated, which means there shall be no access to any live part All joint shall be shrouded with special removable PVC blocks.
f) The hinged door shall be designed to withstand internal arcing and shall be interlocked in such a way that it cannot be opened with the breaker in closed position. Further all operations shall be possible with door closed.
g) Special insulating barrier shall be provided where bus bar passes from one panel to another to restrict arc from propagating, across the full length of the board in event of bus fault.
h) Wiring circuits fed from a supply common to a number of feeder panels shall be protected so that failure of a circuit in any one feeder does not prevent operation of other feeders.
i) Circuit of one feeder panel should be capable of isolation for maintenance purposes without affecting other circuits.

j) Doors, covers and all non-current carrying metallic parts shall be earthed through flexible copper wires. This should also include instrument casing and cable armour, which should also be connected to the earth bus.
k) For safety, a spring-loaded scraping earth shall be provided on each withdrawable tray of drawout design circuit breaker panel ensures continuous earthing when trolley is withdrawn and having direct connection to the main earth bus.

1.4 CONSTRUCTIONAL FEATURES:

1.4.1 The Basic Cubicle:

a) The basic enclosure shall be fabricated from Cold rolled sheet steel material, of thickness not less than 2 mm in all sides. For all the load bearing application sheet steel thickness shall not be less than 2 mm. Doors and covers shall be made of cold rolled sheet steel of thickness not less than 2 mm. Stiffeners shall be provided wherever required. The panel frames shall be fabricated using cold rolled sheet steel of thickness not less than 2.5 mm.
b) The cubicle shall have four distinct compartments each separately earthed – Breaker compartment, Relay & Instrument chamber, Bus bar chamber, CT & Cable chamber.
c) The doors and removable covers shall be provided with neoprene gaskets to make the panel dust and vermin proof.
d) Any metal to metal joint anywhere inside the panel shall be gasketted to achieve zero gap. Between two panels special T type gasket shall be provided for zero gap and aesthetics.
e) The panel board shall be complete with all internal wiring, bus-bars, labels, accessories etc. as specified.
f) Labels shall be provided for all identifiable like breakers, relays, indicating lamps, control switches, selector switches and accessories etc.
g) The panel door shall be opened only by means of tools to prevent unauthorized opening.
h) Painting: Seven-tank process treatment shall be followed for treatment of the fabrication parts of the panel and two coats of epoxy based primer shall be applied before applying two final coats of epoxy paint which shall have good weather resistance and heat transfer properties or Electrostatic epoxy powder coating shall be applied after pre-treatment. The colour of painting shall be RAL 7032.

1.4.2 The Breaker Compartment:

a) The CB compartment shall receive the trolley in case of ACB, which houses the CB and PT. The trolley engagement to the enclosure is of horizontal isolating horizontal draw out type.
b) The CB trolley shall have three distinct positions – Service, test and isolated. All three positions shall have latching facility and service and test positions have locking facility. These two positions shall have limit switch with auxiliary contacts for interlocking.

c) In draw-out air circuit breaker, components of a feeder shall be mounted on withdrawable trolley. The trolley shall be provided with guides and low friction sliding devices. The trolley shall be provided with simple insertion and withdrawal device, which also locks the tray in fully inserted position.
d) ACB's and MCCB's shall be arranged in multi-tier form if design permits looking at its size and thermal properties for better optimization of overall size of enclosure and of available space.

1.4.3 The Bus bar Chamber:

a) The bus bar chamber on the top shall house the bus bars, which shall be accessed only by special tools.
b) Bus bars shall be of Electrolytic Copper material and shall comply the requirements of IS: 8130. The bus bars should have rectangular section. The size of the bus bar should be clearly indicated in the quotation and the current density while calculating the size of the bus bars should be 1.6 A/sq.mm.
c) The bus bars shall be supported non-hygroscopic, anti-tracking high impact epoxy cast resin insulator. The support shall be rigid and suitable for all thermal and electro dynamic stresses arising out of short circuit current for 3 sec.
d) Bus bars shall be designed for rated normal continuous current and fault level for one second as specified in BOM, without injurious heating.
e) Bus bars in the switchgear may be provided with insulating sleeves OR insulating coatings. The sleeves or coating material shall comply with the following requirements:
    1. The insulating material shall safely withstand the hot-spot temperatures of the bus bars.
    2. The material shall be flame retardant in accordance with ANSI-C37.20.
    3. Thermal cycling tests should have been carried out (on representative samples of insulated bus bars) to prove that insulation will not flake off or deteriorate during the expected life of the switchgear which is 30 years. One cycle is from full – load temperature to no-load temperature. Expected numbers of cycles are 20,000.
    4. Accelerated thermal and dielectric aging tests should have been conducted on the material for expected life of the switchgear.
    5. The thickness of insulation on the bus bars shall be sufficient to withstand 1.5 kV rms for one minute.
    6. Minimum phase to phase and phase to earth clearance shall be 25 mm.
    7. The material shall have low dielectric loss.
    8. It shall have good thermal conductivity to dissipate heat.
    9. If there is any de-rating of bus bars due to the above, the same shall be furnished.
f) The bus bars and every tap off joints shall be colour coded.
g) Silver plating of all bus bar joints shall be provided so that temperature rise of 55°C over 50 °C ambient temperature can be allowed as per ANSI C37.20

1.4.4 The CT and Cable Chamber:

a) A spacious cable chamber at the rear of the panel shall be provided. It shall be suitable for receiving number of cables of different size as mentioned in Cable schedule. The cable box shall be accessed through removable rear cover.
b) The cable box shall be design for cable entry from top or bottom as mentioned in BOM. The bus duct entry shall be from top.
c) Sufficient distance between cable gland plate and terminal lug shall be provided for cable termination.
d) For bottom cable entry, a removable 3 mm MS gland plate shall be provided. For single core cable non-magnetic gland plate shall be provided.
e) Various Clearances shall be as per the standards and practices.

1.4.5 The Relay and Instrument Chamber:

a) Protective relays and indicating instruments shall be mounted on the door. Auxiliary relays should be projection mounted inside the cubicle.
b) Control wiring shall be done using 650 V grade grey PVC stranded wire 1.5 sq.mm for control and 2.5 sq.mm for CT circuit.
c) As a standard practice, all control cables shall be neatly bunched together with ferrules at either end of each wire. As per application colour ferrules shall be provided.
d) The wire bunch shall be passed through PVC ducts.
e) For safety and reliability, cable bunch shall be routed through flexible metallic conduit wherever it passes through HV compartments like breaker, PT chamber etc.
f) Bus wiring shall be through grommets. Separate terminal stack shall be provided for inter-panel wiring.
g) All wiring practices shall be as per IS-375.

1.5 AIR CIRCUIT BREAKER (ACB):

a) Air Circuit Breakers shall fully conform to IS: 13947 part I & III.
b) ACBs shall be designed for circuit protection of 415 V, three phase four wire AC distribution system. They shall be designed for use in panel boards as main breakers and for protection of feeder circuits and connecting equipment.
c) The ACB's shall be suitable for installation on multi-tier panel box.
d) The terminals of the ACBs shall be designed to maintain adequate clearances and to accept Aluminium cables and busbars.
e) ACBs shall be of draw-out type, electrically/motor operated and of ratings as per BOM. The fully draw out type compartments shall be provided.
f) All ACBs shall be provided with integrated Microprocessor based trip releases for overload, short circuit and earth fault with multiple characteristic curves and adjustable setting for each characteristic to ensure proper co-ordination with upstream and downstream breakers.
g) For all air circuit breakers, monitoring of close and trip circuit voltages, trip coil shall be provided.

h) Each circuit breaker shall be provided with distinct SERVICE/TEST/ISOLATED positions.
i) Potential free auxiliary contacts suitable for integration with SCADA shall be provided for ACB's status indication (ON, OFF & TRIP) and remote operation (closing and opening), relay status monitoring.
j) Motor for ACBs shall be rated at 220V DC.

1.6 MOLDED CASE CICUIT BREAKER (MCCB) :

a) Molded Case Circuit Breakers shall fully conform to IS: 13947 part II.
b) MCCB's shall be designed for circuit protection of 415 V, three phase four wire AC distribution system. They shall be designed for use in panel boards as main breakers and for protection of feeder circuits and connecting equipment.
c) The terminals of the MCCB's shall be designed to maintain adequate clearances and to accept Aluminium cables.
d) The insulating case and cover shall be made of high strength, heat resistant, flame retardant thermosetting material, providing a very high dielectric strength, high withstand capability against thermal and mechanical stresses, protection against secondary fire hazards and enhanced safety of operating personnel.
e) All MCCB's shall be provided with integrated static trip releases for overload, short circuit and earth fault with multiple characteristic curves and adjustable setting for each characteristic to ensure proper co-ordination with overload, short circuit and earth fault protection provided on upstream and downstream (a) air circuit breakers and (b) MCCB shall be provided.
f) Potential free auxiliary contacts suitable for integration with SCADA shall be provided for MCCB's status indication (ON, OFF & TRIP).

1.7 CURRENT TRANSFORMERS:

a) Current transformers shall comply with IS: 2705.
b) Construction of CT’s shall be bar type, separately mounted type.
c) CT’s shall be provided with two (2) nos. of cores, one for metering and another one for protection. Each core shall carry its own secondary winding.
d) Protection CT core are intended for Over load, Short circuit current and Earth fault protection, the design should be based on the information provided below.

1.8 POTENTIAL TRANSFORMERS:

a) Potential transformers shall comply with IS:3156.
b) PT’s shall be of Magnetic type.
c) PT’s shall be single of core and should be used for both metering and protection.
d) Protection is intended for under voltage protection.

1.9 PROTECTION, METERING AND INDICATION:

1.9.1 Protection & Control:

a) Each Air circuit breaker (ACB) shall be provided with Microprocessor based releases for overload, short circuit and earth fault.
b) Under-voltage relays should be provided in all incoming feeders to monitor the availability of power supply in each bus of LT panels. When loss of supply is detected, designated feeders should be automatically disconnected using multiplied contacts of the Under-voltage relays.
c) Each downstream MCCB shall be provided with Static trip releases for overload, short circuit and earth fault protection.
d) The relays should feature inherent high accuracy, high reliability and stable characteristics for both current and time setting functions.
e) The relays should provide guaranteed performance in the specified operating conditions at specified ambient conditions without any need for specific ventilation or air conditioning.
f) Adequate number of relay auxiliary contacts should be available for direct interface with breaker, monitoring and interlocking.
g) Auxiliary contacts associated with ACBs/ MCCBs /Relays for all above fault conditions or combined fault signal suitable for integrating with computer based supervisory control and data acquisition system (SCADA) shall be provided.
h) All ACB incoming and outgoing feeder control signals ON, OFF and TRIP shall be available for remote operation.
i) For all downstream MCCB outgoing feeders control switch shall be provided for local operation in panel itself.
j) Flexible settings on protection relays and releases shall be provided as follows :
    i. Over load setting: 0.4 to 1.0 times the rated current.
    ii. Over load time delay: 5 to 40 sec.
    iii. Short circuit pick up level setting: 1.5 to 14 times the rated current.
    iv. Short circuit time delay: Inst., 30 to 300 msec.
    v. Earth fault settings: 0.2 to 0.8 times the rated current
    vi. Earth fault time delay: Inst., 100 to 300 msec.
    vii. Under voltage settings: 0.35 to 1.1 of rated voltage.
    viii. Under voltage time delay: Inst., to 0.5 sec.

1.9.2 Metering:

a) As per BOM/SLD Incoming and Outgoing feeders shall be provided Ammeter with ampere selector switch and current transducer. Ammeter range will be same as CT primary rating.
b) All Incoming feeders shall be provided, Voltmeter of scale 0-500 V with voltage selector switch and voltage transducer.
c) All above meter shall be Panel mounting type and digital, 96 mm^2size for all feeders.

d) All measured signals for current and voltage associated with every feeder shall be available for integration with SCADA remotely through Ampere Transducer (AT). One spare output from AT shall be provided.
e) Contractor should indicate the control supply voltage and provision made for providing control supply to the various transducers in each L.T. Panel.
f) Protective fuses/MCBs of 4 A rating associated with voltage measurement and protection shall be provided.

1.9.3 Indication:

a) A set of indicating lamps of reputed make like Siemens or Teknic showing breaker status (ON, OFF & TRIP) shall be provided with auxiliary contacts for remote monitoring.
b) Visual indication within breaker panel for breaker Service/Test/Isolated position shall be provided for draw out ACBs.
c) Protective fuses/MCBs of 4 A rating associated with all indicating lamps shall be provided.

1.10 ACCESSORIES:

All breaker panels shall be provided with following accessories -

a) Motor-wound spring charged closing mechanism with motor suitable for 220V DC for ACB's
b) Earth fault relay for all downstream MCCB outgoing feeders.
c) U/V trip suitable for 220 V AC for all incoming feeders.
d) Closing release/coil suitable for 220 V DC for all ACBs.
e) CTs of rating specified in BOM for all the feeders.
f) PTs of rating specified in BOM for all incoming feeders.
g) Auxiliary contacts - 4 NO + 4 NC for ACB and 2 NO + 2 NC for MCCB.
h) Door Operating Mechanism with handle for MCCBs

1.11 EARTHING:

a) A copper earth bus of size not less than 35 x 6 mm^2 continuously runs at the bottom of the panel shall be provided.
b) The earth bus shall be robust and capable of carrying full short circuit current for 1 sec.
c) Doors, covers and all non-current carrying metallic parts shall be earthed through flexible copper wires. This should also include instrument casing and cable armour, which should also be connected to the earth bus.
d) The earth bus shall have provisions for terminals at each end for connecting to grid earthing.

1.12 BILL OF MATERIAL

LTP#30 (R&D Building Emergency Panel)

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
R&D Building Emergency Panel	Incomer from LTP#28	4 Pole ACB, 800A, 50 kA Isc.	800/5	415/ 110	MFM: 0 - 800 A, 0 - 500 V, f, kW, KVA, PF	50, 51, 50N, 51N
	OG_F1: UB Ext. Bldg Emer	4 Pole MCCB, 400A, 35 kA Isc.	400/5		0 - 400 A,	Overload, Short-Circuit and Earth Fault Protection
	O/G_F2: Exp Emer	4 Pole MCCB, 250A, 35 kA Isc.	250/5		0 - 250 A	Overload, Short-Circuit and Earth Fault Protection
	O/G_F3: SST Bldg Emer	4 Pole MCCB, 630A, 35 kA Isc.	630/5		0 - 630 A,	Overload, Short-Circuit and Earth Fault Protection
	O/G_F4: LTP#9	4 Pole MCCB, 400A, 35 kA Isc.	400/5		0 - 400 A	Overload, Short-Circuit and Earth Fault Protection
	O/G_F5: DC PS	4 Pole MCCB, 250A, 35 kA Isc.	250/5		0 - 250 A	Overload, Short-Circuit and Earth Fault Protection
	O/G_F6: Spare	4 Pole MCCB, 250A, 35 kA Isc.	250/5		0 - 250 A	Overload, Short-Circuit and Earth Fault Protection

LTP#31 (Main Panel)

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
LTP # 31 Magnet Area	Incomer from LT Panel#21	4 Pole ACB, 4000A, EDO Type, 65 kA Isc.	4000/5	415/ 110	MFM: 0 - 4000 A, 0 - 500 V, f, kW, KVA, PF	50, 51, 50N, 51N
	O/G F#1: LT Panel#32	3 Pole ACB, 2500A, 65 kA Isc.	2500/5		0 - 2500 A,	50, 51, 50N, 51N
	O/G F#2: LT Panel#33	3 Pole ACB, 2500A, 65 kA Isc.	2500/5		0 - 2500 A,	50, 51, 50N, 51N
	O/G F#3: LT Panel#34	3 Pole ACB, 2500A, 65 kA Isc.	2500/5		0 - 2500 A,	50, 51, 50N, 51N
	O/G F#4: LT Panel#35	3 Pole ACB, 2500A, 65 kA Isc.	2500/5		0 - 2500 A,	50, 51, 50N, 51N
	O/G F#5: Spare	3 Pole ACB, 2500A, 65 kA Isc.	2500/5		0 – 2500A	50, 51, 50N, 51N
	O/G F#6: Spare	3 Pole ACB, 2500A, 65 kA Isc.	2500/5		0 – 2500A	50, 51, 50N, 51N
	O/G F#7: Bus-Coupler	4 Pole ACB, 2500A, 65 kA Isc.	2500/5		0 – 2500A	50, 51, 50N, 51N

LTP#32 (Magnet Area Panel)

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
LTP # 32 Magnet Area Panel	Incomer from LT Panel#31	4 Pole ACB, 2500A, EDO Type, 65 kA Isc.	2500/5	415/ 110	MFM: 0 - 2500 A, 0 - 500 V, f, kW, KVA, PF	50, 51, 50N, 51N

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
	O/G F#1:	3 Pole ACB, 1250A, 50 kA Isc.	1250/5		0 - 1250 A	50, 51, 50N, 51N
	O/G F#2:	3 Pole ACB, 2500A, 50 kA Isc.	1250/5		0 - 1250 A	50, 51, 50N, 51N
	O/G F#3:	3 Pole ACB, 2500A, 50 kA Isc.	1250/5		0 - 1250 A	50, 51, 50N, 51N

LTP#33 (Diverter Area Panel)

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
LTP # 33 Diverter Area Panel	Incomer from LT Panel#31	4 Pole ACB, 2500A, EDO Type, 65 kA Isc.	2500/5	415/ 110	MFM: 0 - 2500A, 0 - 500 V, f, kW, KVA, PF	50, 51, 50N, 51N
	Divertor F1: High Heat Flux System 300 kW	3 Pole ACB, 1250A, 50 kA Isc.	1250/5		0 - 1250A	50, 51, 50N, 51N
	Divertor F2: HPHT Water/ He Loop	3 Pole ACB, 1250A, 50 kA Isc.	1250/5		0 - 1250A	50, 51, 50N, 51N
	Divertor F3: PDB#4	3 Pole ACB, 800A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N
	O/G F#4: Spare	3 Pole ACB, 800A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N

LTP#34 (Cryo + LS Cryo)

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
LTP # 34 Cryo + LS Cryo + Others	Incomer from LT Panel#31	4 Pole ACB, 2500A, EDO Type, 65 kA Isc.	4000/5	415/ 110	MFM: 0 - 2500 A, 0 - 500 V, f, kW, KVA, PF	50, 51, 50N, 51N
	O/G F#1: Cryo	3 Pole ACB, 1250A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N
	O/G F#2: LS Cryo	3 Pole ACB, 1250A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N
	O/G F#3: MBPSI + others	3 Pole ACB, 800A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N
	O/G F#4: Misc	3 Pole ACB, 800A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N
	O/G F#5: Spare	3 Pole ACB, 800A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N
	O/G F#6: Spare	3 Pole ACB, 800A, 50 kA Isc.	800/5		0 - 800A	50, 51, 50N, 51N

LTP#35 (Second Floor Panel)

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
LTP # 35 Second Floor Panel	Incomer from LT Panel#31	4 Pole ACB, 2500A, EDO Type, 65 kA Isc.	2500/5	415/ 110	MFM: 0 - 2500 A, 0 - 500 V, f, kW, KVA, PF	50, 51, 50N, 51N

Panel	Load	Circuit Breaker	CT Ratio (A/A)	PT Ratio (V/V)	Meters (Digital)	Protection
	O/G_F1	3 Pole ACB, 800A, 50 kA Isc.	800/5		0 - 400 A	50, 51, 50N, 51N
	O/G_F2	3 Pole MCCB, 630A, 35 kA Isc.	250/5		0 - 250 A	Overload, Short-Circuit and Earth Fault Protection
	O/G_F3	3 Pole MCCB, 400A, 35 kA Isc.	630/5		0 - 630 A	Overload, Short-Circuit and Earth Fault Protection
	O/G_F4	3 Pole MCCB, 400A, 35 kA Isc.	400/5		0 - 400 A	Overload, Short-Circuit and Earth Fault Prot.

General Description: Indoor, Floor mounted, draw-out type 415 V circuit breaker panel suitable for use on 415V ±10% 3Ø 4 wire, 50 Hz System, fully confirming to the specifications and SLD, complete with main horizontal bus-bars of ***adequate rating*** and neutral of half the main bus rating with incoming feeder. Provision for Top/Bottom cable entry to be provided for incoming and outgoing feeders.
Accessories: 1 set of Lamps (Red, Green, Yellow) for CB ON/OFF/TRIP indication for each I/C and O/G Feeder; Shunt Trip Coil, Closing Coil for ACB; Auxiliary s/w 4 NO + 4 NC for ACB; Mechanical ON/OFF indicator and spring charge indicator; 1 no. space heater with s/w and thermostat for each vertical section; 1 no. cubicle lamp with s/w and fuse; independent DP s/w with HRC fuse/MCB for DC close and trip control supplies and DP s/w with HRC fuse/MCB for AC control Supply.

1.13 DRAWING:

Detailed Power and Control circuit drawing along with fabrication drawings showing breaker arrangement and the overall size of bus bars, enclosure, fixing details, support, joints, etc. shall be submitted by the successful bidder for approval of purchaser. The bidder shall incorporate purchaser's comments/modification suggested. Actual fabrication of the Panels shall be carried out only after the approval of the purchaser.

1.14 TESTS:

1. All routine tests shall be conducted, as per relevant IS standard specified.
1. In case supplier has carried out type tests on similar type and rating of Panels, test reports may be submitted with the offer as a part of the eligibility criteria.

1.15 UNLOADING AND STORAGE:

VENDOR has to take the complete responsibility of the unloading of the L.T. Circuit Breaker Panel at proper location at the site. The accessories shall be unloaded and store at vendor's responsibility at the site. Vendor will be fully responsible for timely unloading of equipment and accessories. IPR will not bear any expenses for the delay in unloading the equipment in the scope of this specification.

TECHNICAL SPECIFICATIONS FOR L.T. CIRCUIT BREAKER PANELS

Sr. No.	Parameters	Data	
1	**General :**		
	Type of L. T. Panel	Breaker	
	Application	For Distribution	
	Quantity	6 nos.	
	Installation	Indoor	
	Type of panel mounting	Body mounted	
	Ambient temperature	as per Proj. Inf – I	
2	**System Data :**		
	Rated Voltage	415 V	
	Rated Frequency	50 Hz	
	No. of Phases	3 ph, 4 wire	
	Fault Level	As per SLD	
	Grounding	Effective	
3	**Ratings :**	**ACB**	**MCCB**
	Rated normal current	as per BOM	as per BOM
	No. of Poles	as per BOM	as per BOM
	Rated Voltage	415 V	415 V
	Rated Frequency	50 Hz	50 Hz
	Rated insulation voltage	1.1 kV	≥690 V
	Rated impulse voltage	8 kV	8 kV
	Rated short circuit breaking capacity	as per BOM	as per BOM
	Rated short circuit making capacity (peak)	2.5 times	2.5 times
	Type of Mounting	Drawout	Fixed
	Releases	Microprocessor	Static/Microprocessor
	Operating Mechanism	Motorised	Trip Free

Sr. No.	Parameters	Data	
	Operating time: Opening time Closing time	≤70 ms ≤ 70 ms	≤ 70 ms ≤ 70 ms
	Method of operation	Local & Remote	Local
	Auxiliary supply Voltage	220V, DC	220VDC
4	**Bus Bar :**		
	Rated normal current	as per BOM	
	Rated voltage	415 V	
	Rated Frequency	50 Hz	
	No. of phases	TPN	
	Rated insulation test voltage	2.5 kV	
	Rated short circuit current	As per SLD	
	Rated peak short circuit current	2.5 times short ckt. Current	
	Max. rise in temperature above ambient	55 °C	
	Insulation	Heat shrinkable PVC sleeves	
5	**Terminal Connections :**	as per BOM	
	Incoming Feeders	By XLPE Cables	
	Outgoing Feeders	By XLPE Cables	
6	**CT :**		
	Type	Cast resin	
	Ratio	as per BOM	
	Accuracy Class : a) Measuring core b) Protective core	 1 5P	
	Rated Burden : a) Measuring core b) Protective core	 10 VA 15 VA	
	Accuracy limit factor : a) Measuring core b) Protective core	 1 10	
	Short time current rating	of breaker rating with which it is associated as per BOM	
	Rated insulation test voltage	2.5 kV	
7	**PT :**		
	Type	Cast Resin	
	Number of secondary	1 (One)	
	Ratio	415 V / 110 V	
	Accuracy class : a) Measuring core	 3	

Sr. No.	Parameters	Data
	Rated burden : a) Measuring core	 50 VA
	Voltage factor and rated time	1.2 continuous
	Rated insulation test voltage	2.5 kV
8	**Accessories :**	
	Under voltage relay	1) with Trip contacts required 2) Local /Remote
	Earth fault relay	1) with Trip contacts required 2) Local/Remote
	Shunt trip	1) with contacts required 2) Local/Remote
	Closing coil	1) with contacts required 2) Local/Remote
	Auxiliary contacts	4 NO + 4 NC – for ACB 2 NO + 2 NC – for MCCB
	Visual indicating lamp	ON, OFF & TRIP -230V 1ph AC
	Ammeters and Voltmeter	as per BOM (digital type)
	Current Transducer and Voltage Transducer	4-20 mA
	Door lock	1) with contacts required 2) Local/Remote
	Safety Shutter	1 no. for each ACB
	Space heater with s/w & thermostat	1 no. for each vertical section
9	**Enclosure :**	Cubical pattern, sheet steel, dust and vermin proof suitable for indoor installation with IP-52 degree of protection.
10	**Clearances :**	Various electrical clearances like phase to phase & phase to earth on poles, busbars, cable & busduct terminating boxes etc. shall be in accordance with applicable standards and Indian Electricity Rules.

INSPECTION/TESTING

The vendor shall have all the testing facilities for testing at Factory & site mentioned below including any other test as specified in IS Specification. Contractor shall arrange for all the tests and inspection at factory and site at his own cost.

Contractor should arrange for the visit of two engineers deputed by purchaser for factory inspection.

The successful bidder shall furnish to the purchaser Routine test certificates for prior approval before despatch of any equipment from the works and the approval in writing from the purchaser is essential to affect the despatch of the equipment.

The test reports shall be submitted completed with identification data including serial number of equipment.

Test shall be performed in presence of purchaser's representative, if so desired by the purchaser.

The successful bidder should give at least two weeks advance notice of the date when the tests are to be carried out.

Following Factory Acceptance Tests shall be carried out at on the complete panel at factory:

- Physical inspection of LT Panel.
- Verification of BOM
- High Voltage Test at 2500 V for one minute.
- Insulation Resistance Test at 1000 V Megger.
- Phase Sequence Test.
- Continuity Test.

REFERENCE STANDARDS:

Sr. No.	Description	Standard No.
1.	L.T. Panels	IS - 8623
2.	ACB	IS - 13947 part 1 & 3
3.	MCCB	IS - 13947 part 2
4.	Current Transformer	IS - 2705
5.	Potential Transformer	IS - 3156
6.	Distribution Board	IS - 13032 / 8623
9.	Bus bars and bus bars connection	IS - 159
10.	Bus bar supporting insulators	IS - 2544

INSTALLATION AND COMMISSIONING

The vendor shall be responsible for the site mobilization to install and commissioning of the L.T Circuit Breaker Panel.

Fixing the panel at the desired location in the IPR is in the scope of the Vendor. This includes grouting, fixing bolts; foundation bolts etc. along with supply of required hardware for fixing of L.T. Panels. The Vendor shall take the approval of the Engineer-in-charge before the commencement of the work.

All the installation tools and commissioning spares are to be provided by Vendor. This includes crane of suitable capacity, trailer, megger (5 kV) and any other instruments or tools required during the erection and commissioning.

The installation work should be carried out immediately after receipt of intimation from IPR in that regard.

During commissioning the successful Vendor has to perform all the required operational tests mentioned in the scope.

Following acceptance tests should be carried out at site:

- Physical inspection of LT Panel.
- Insulation Resistance Test at 1000 V Megger.
- Phase Sequence Test.
- Continuity Test.
- Interlocks and Operation test

1. DRAWINGS, OPERATION/INSTRUCTION MANUALS :

1. Drawing shall be submitted to IPR for approval after placement of the purchase order before commencing the manufacture and construction. The drawing and data to be submitted after Purchase Order should include the following:
   a) Assembly drawing of the switchgear showing plan, elevation and typical sectional views and locations of breaker compartment, cable terminations, busbar chamber, metering and relay compartment and terminal blocks for external wiring connections. Marshalling panel GA drawing showing the layout of the terminal block and cabling etc.
   b) Schematic diagrams for control and protection of circuit breakers.
   c) Foundation plan showing location of foundation channels, anchor bolts and anchors, floor plans and openings for cables/bus ducts etc.
   Foundation plan showing location of foundation channels, anchor bolts and anchors, floor plans etc.

2. Along with the delivery of L.T. Circuit Breaker Panels and the Vendor shall supply operation/instruction manuals/catalogs for all the equipment, drawings of accessories and circuit diagram.
3. Three sets of final drawings shall be provided along with the delivery of the Panels.
4. Reproducible for all drawings shall be supplied.

Important Notes :

1. Bidders are requested to complete the technical particulars in the data sheets appended hereunder and submit them with their offer.
2. Bidders are also required to offer price details in the format enclosed (Part-II-Price Bid Format).

A - TECHNICAL PARTICULARS TO BE SUBMITTED ALONGWITH THE TENDER

(Bidders are requested to complete the data sheets and submit the same with their bids)

L. T. CIRCUIT BREAKER PANELS

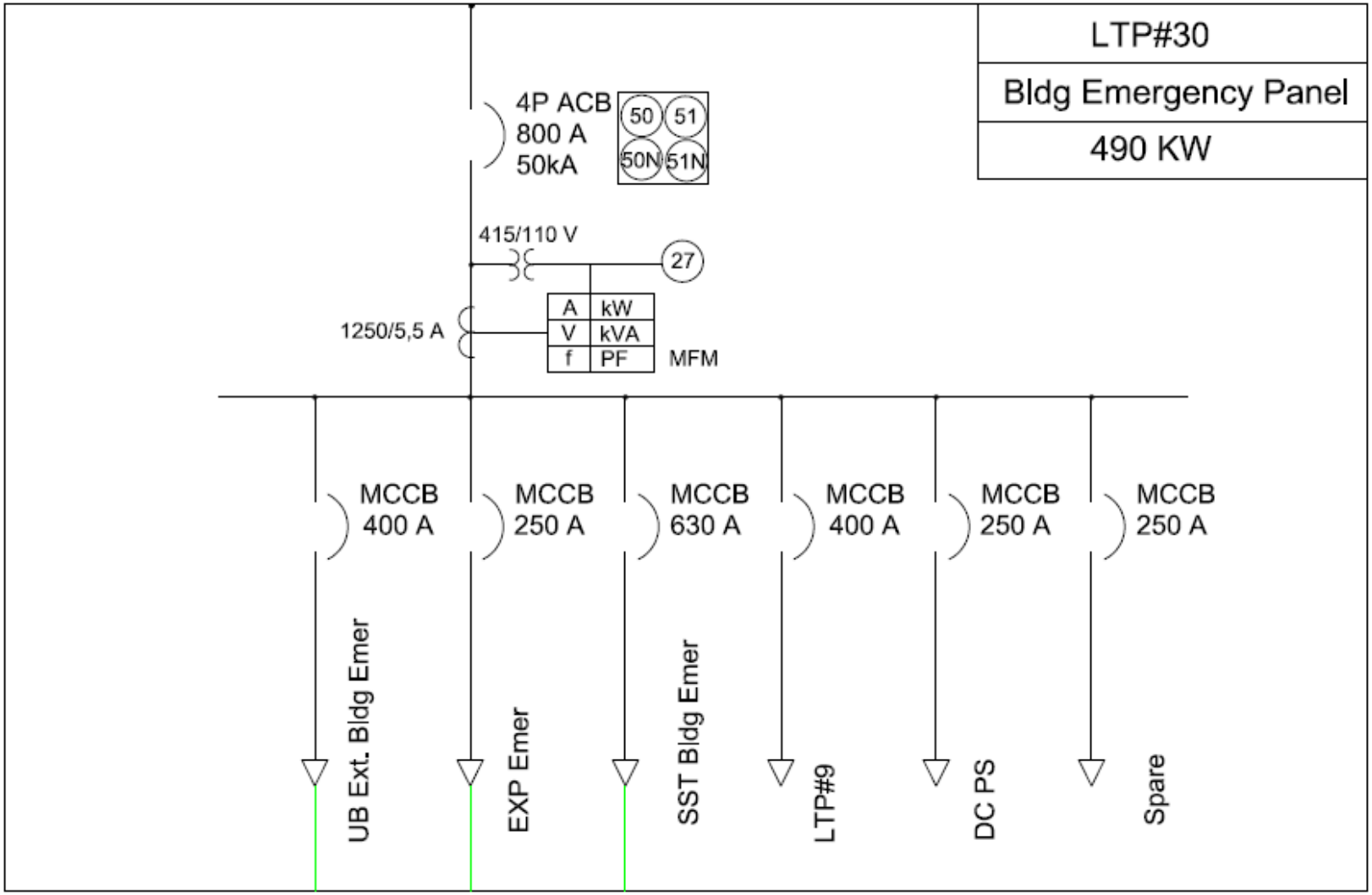
(Please fill the Data separately for individual type and size of breaker offered)

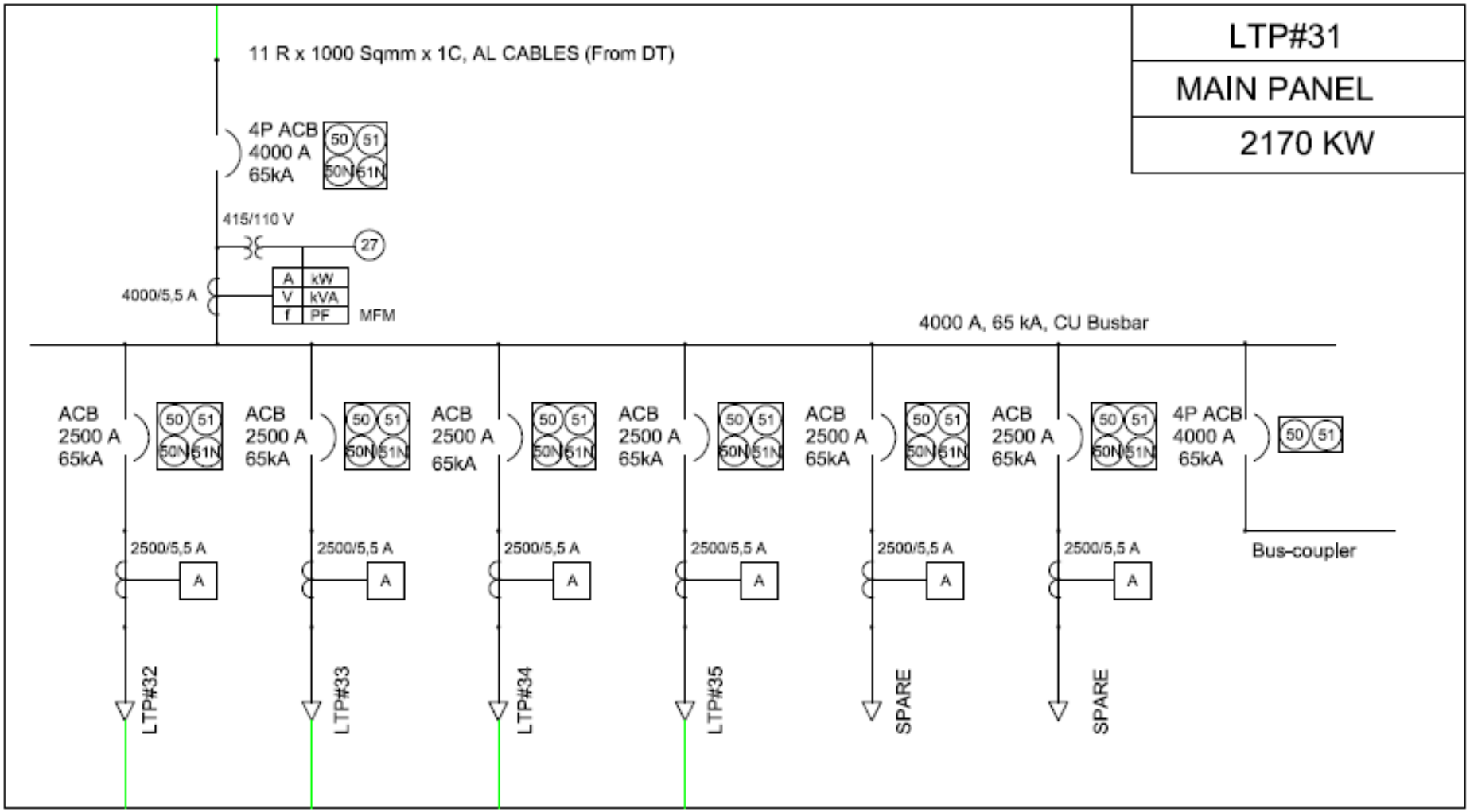
Sr. No.	Parameter Description	IPR Specifications	Data	
1.	**General :**			
	Name of the manufacturer	-		
	Manufacturer's type	-		
	Type of construction	Floor Mounted / Fixed Mounted		
	Suitable for indoor/outdoor application	Indoor		
	Design ambient temperature	max 47°C, average 35°C	°C	
	Meters (Voltmeter, Ammeter, MFM)	96x96 mm, Digital (Schneider/LT)		
	Indicating Lamps	LED type , 220 V DC Siemens, Teknic		
	Control wire size and make	1.5 sq. mm Cu; Finolex, Havells, Polycab		
	Auxiliary Contactors/Push Buttons/TNC/Selector Switch	230 VAC/220 V DC L&T, Siemens, Schneider, ABB		
2.	**Breaker :**		**ACB**	**MCCB**
	Name of the Manufacturer	Schneider, L&T, ABB,		
	Number of Poles	As Per BOM		
	Rated Current	As Per BOM	A	A
	Rated Voltage	415 V		
	Frequency	50 Hz	Hz	Hz
	Rated insulation Voltage	1.0 kV(ACB) ≥690 V (MCCB)	V	V

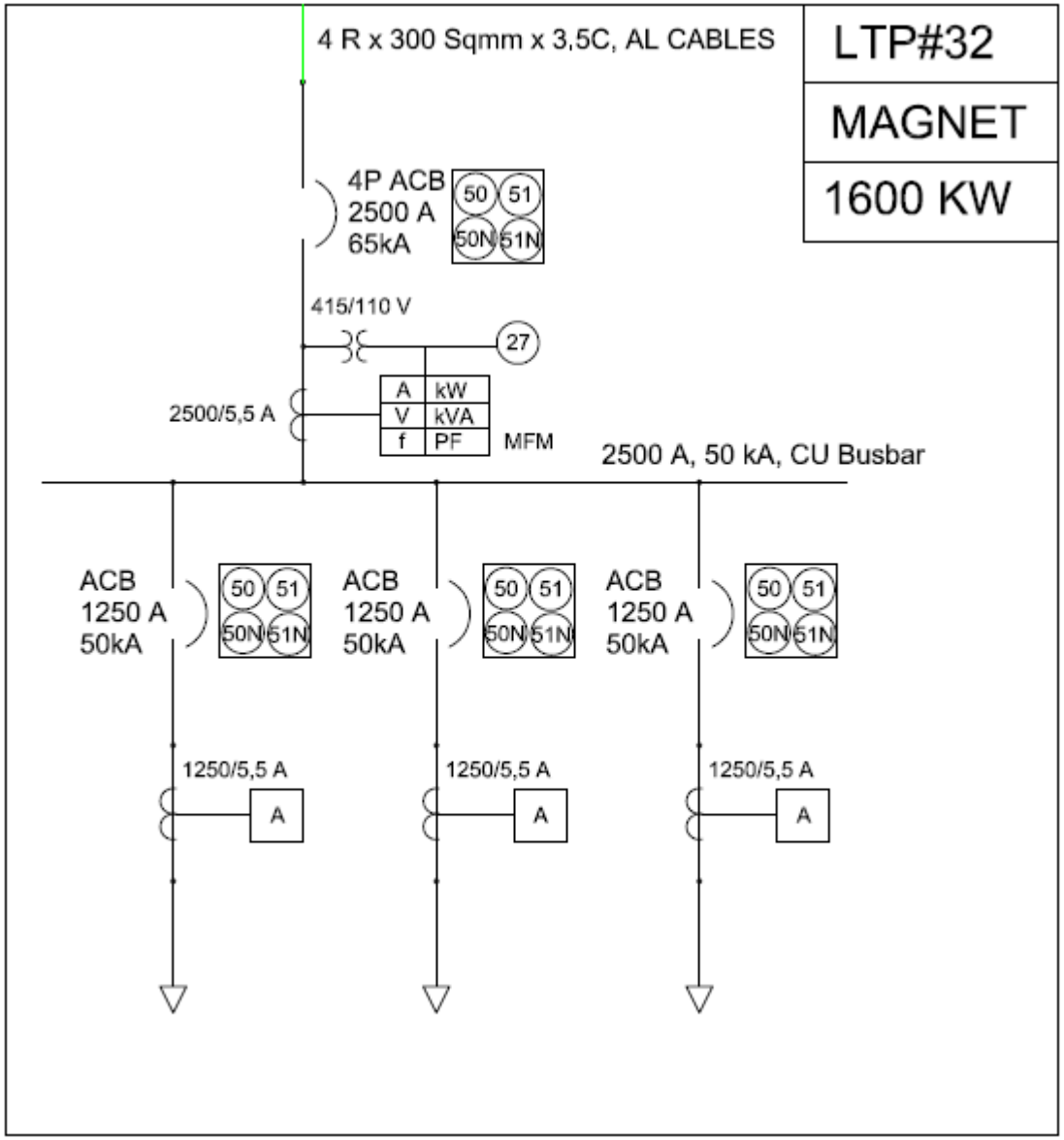
Sr. No.	Parameter Description	IPR Specifications		Data	
	Rated impulse withstand Voltage	8 kV		kV	kV
	Power frequency withstand Voltage	2.5 kV		kV	kV
	Rated short time withstand current for 1 sec.	50 kA		kA	kA
	Releases : Microprocessor / Static	Microprocessor (ACB) Static/Microprocessor (MCCB)			
	Operating Mechanism	Electrical Drawout type (ACB) Manual fixed type (MCCB) with Door Operating Mechanism			
	External protection relay provided If yes, List out indicating type, quantity, make, rating, settings etc.			YES / NO Enclose separate sheet	YES / NO
	Protection available for • Overload • Short circuit • Earth Fault	YES YES YES	YES YES YES		
	Whether following contacts for remote monitoring of breaker provided - • Breaker Status Indication and No. Of Contacts • Contacts for Breaker Releases Operation No. of Contacts • Breaker Remote Operation and No. of Contacts	Yes Yes Yes	Yes Yes No	YES / NO YES / NO YES / NO	YES / NO YES / NO YES / NO
3.	**Bus bar :**				
	Material& Size	Copper, size as per current density 1.6A/			

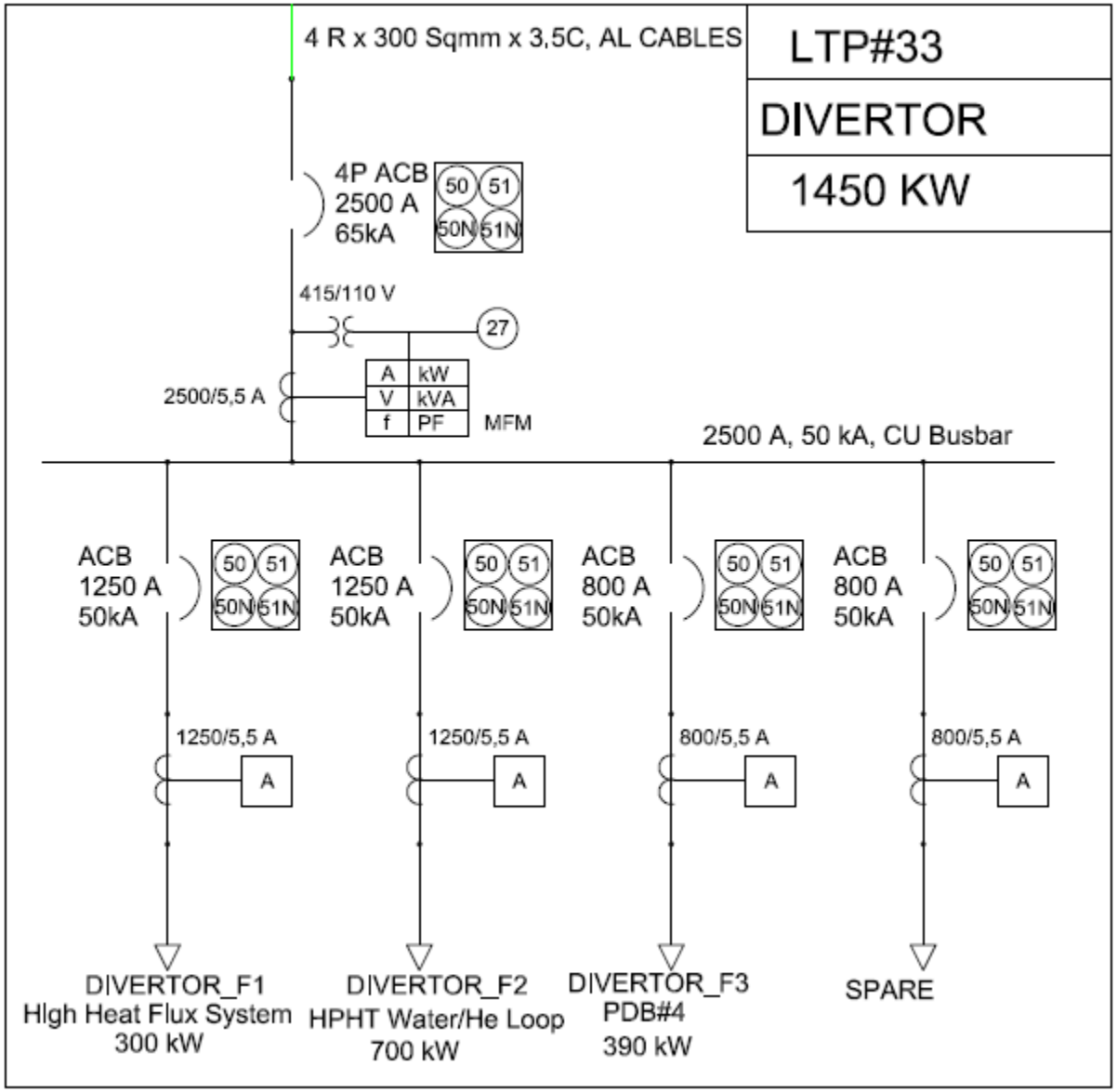
Sr. No.	Parameter Description	IPR Specifications	Data
		sq. mm	
	Rated continuous current	As per BOM	A
	Rated short circuit withstand current	As per BOM	kA
	Rated peak short circuit withstand current	105 kA	kA
	Temperature rise at rated current over design ambient temperature	55 °C	°C
	Insulation	Heat Shrinkable PVC Sleeves	
	Earth Bus: Material & size	35 x 6 sq. mm Copper	
4.	**Current Transformer :**		
	Make and type	AE / Kappa	
	Current ratio	As per BoM	A/A
	Insulation withstand level	2.5 kV	kV
	CT wiring	2.5 sq. mm Cu	
	CT terminals	Short link type	
5.	**Potential Transformer :**		
	Make and type	AE / Kappa	
	Voltage ratio	As per BoM	V/V
	Insulation withstand level	2.5 kV	kV
7.	**Enclosure :**		
	Suitable for indoor/outdoor application	Indoor	
	Thickness of sheet steel	2mm	mm
	Sheet metal cold rolled/hot rolled	CRCA	
	Degree of protection (as per IS:2147)	IP 52	
	Colour of finish paint : a) Outside b) Inside	RAL 7032	

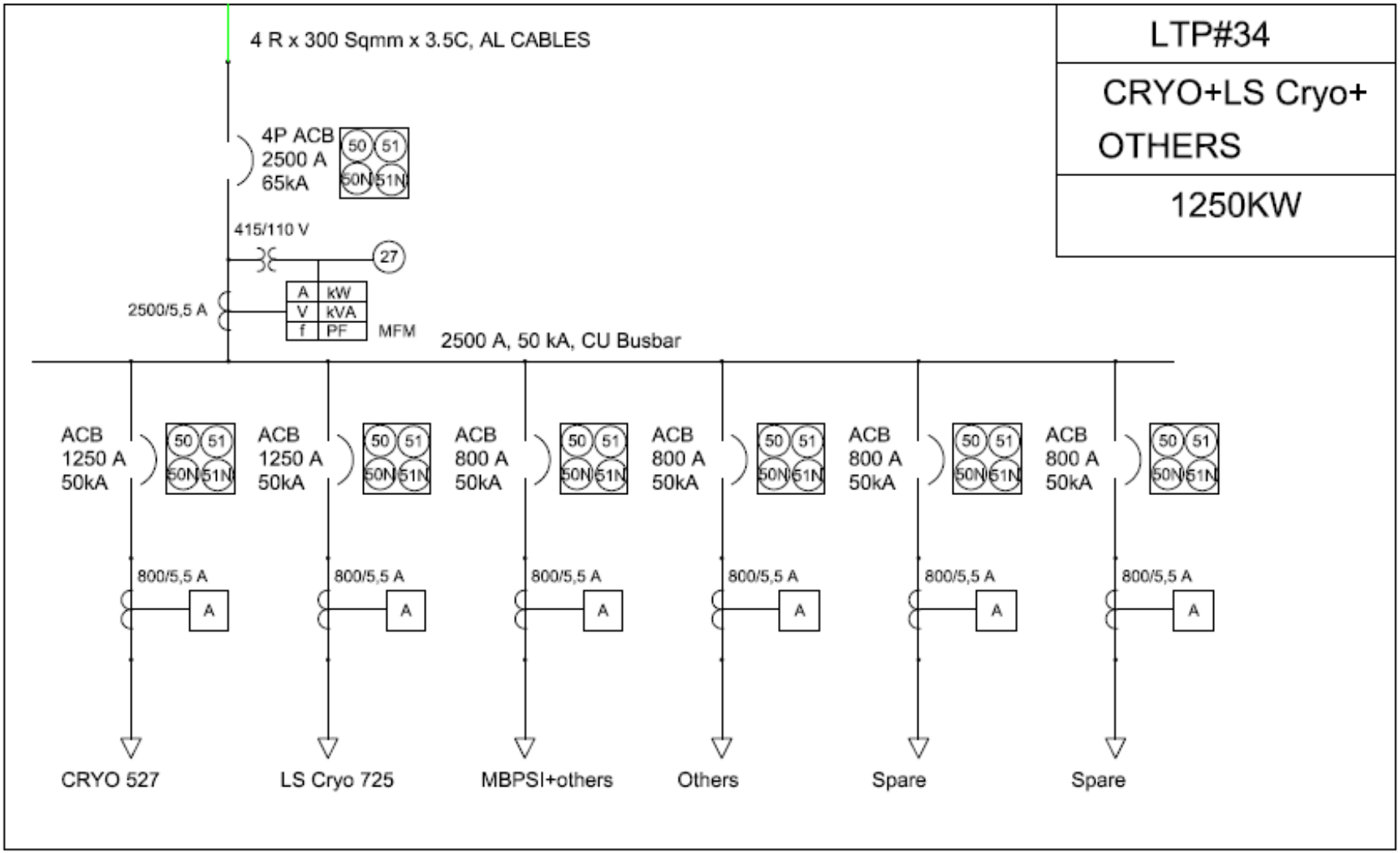
SINGLE LINE DIAGRAM

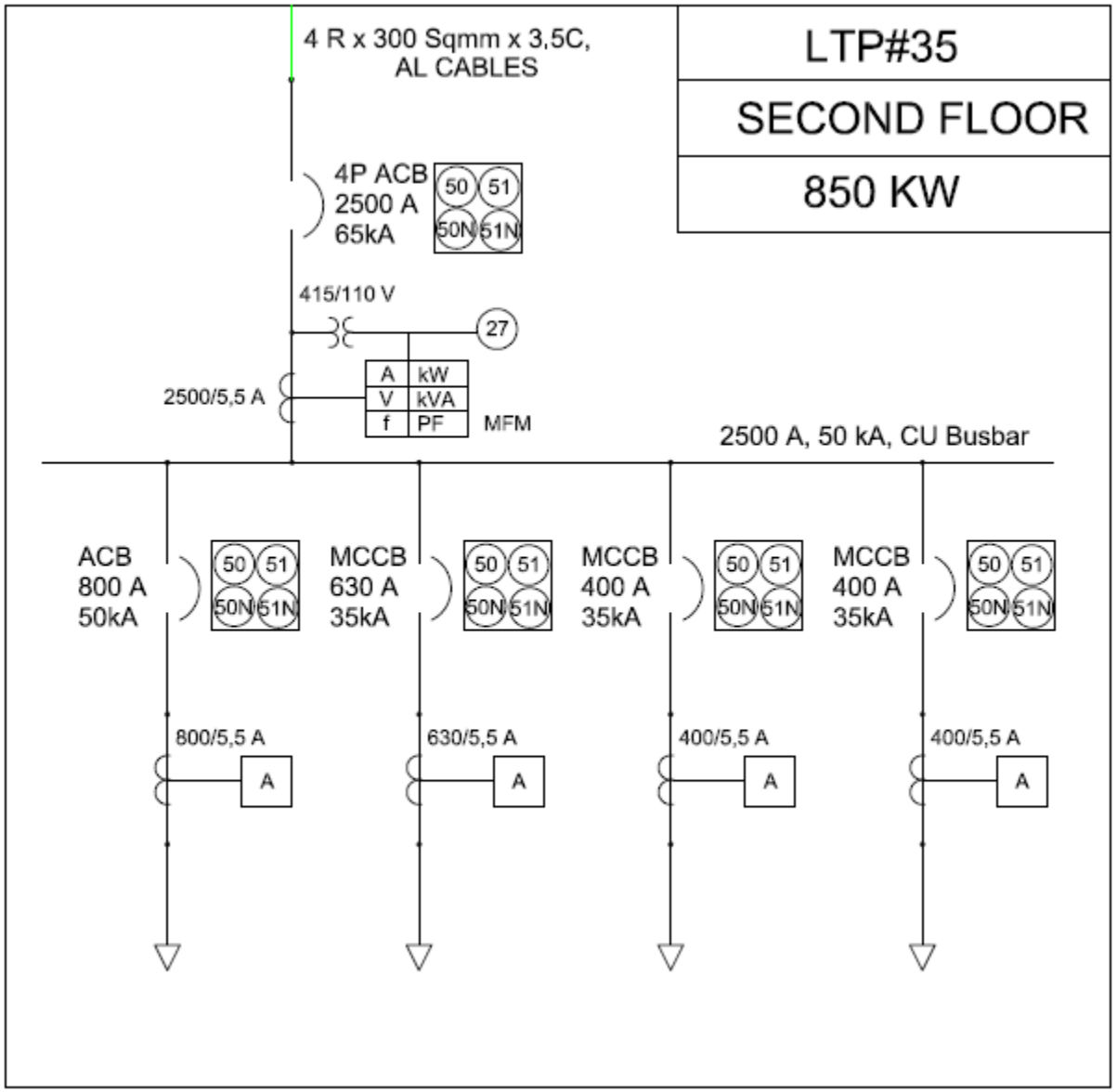



LTP#31
MAIN PANEL
2170 KW
11 R x 1000 Sqmm x 1C, AL CABLES (From DT)
4P ACB
4000 A
65kA
50
51
50N
51N
415/110 V
27
4000/5,5 A
A
kW
V
kVA
f
PF
MFM
4000 A, 65 kA, CU Busbar
ACB
2500 A
65kA
4P ACB
4000 A
65kA
2500/5,5 A
A
LTP#32
LTP#33
LTP#34
LTP#35
SPARE
SPARE
Bus-coupler


4 R x 300 Sqmm x 3,5C, AL CABLES
LTP#32
MAGNET
1600 KW
4P ACB
2500 A
65kA
50
51
50N
51N
415/110 V
27
2500/5,5 A
A
kW
V
kVA
f
PF
MFM
2500 A, 50 kA, CU Busbar
ACB
1250 A
50kA
1250/5,5 A
A


4 R x 300 Sqmm x 3,5C, AL CABLES
LTP#33
DIVERTOR
1450 KW
4P ACB
2500 A
65kA
50
51
50N
51N
415/110 V
27
2500/5,5 A
A
kW
V
kVA
f
PF
MFM
2500 A, 50 kA, CU Busbar
ACB
1250 A
50kA
ACB
1250 A
50kA
ACB
800 A
50kA
ACB
800 A
50kA
1250/5,5 A
A
1250/5,5 A
A
800/5,5 A
A
800/5,5 A
A
DIVERTOR_F1
Hlgh Heat Flux System
300 kW
DIVERTOR_F2
HPHT Water/He Loop
700 kW
DIVERTOR_F3
PDB#4
390 kW
SPARE


LTP#34
CRYO+LS Cryo+
OTHERS
1250KW
4 R x 300 Sqmm x 3.5C, AL CABLES
4P ACB
2500 A
65kA
50
51
50N
51N
415/110 V
27
2500/5,5 A
A
kW
V
kVA
f
PF
MFM
2500 A, 50 kA, CU Busbar
ACB
1250 A
50kA
ACB
1250 A
50kA
ACB
800 A
50kA
ACB
800 A
50kA
ACB
800 A
50kA
ACB
800 A
50kA
800/5,5 A
A
CRYO 527
LS Cryo 725
MBPSI+others
Others
Spare
Spare


4 R x 300 Sqmm x 3,5C,
AL CABLES
LTP#35
SECOND FLOOR
850 KW
4P ACB
2500 A
65kA
50
51
50N
51N
415/110 V
27
2500/5,5 A
A
kW
V
kVA
f
PF
MFM
2500 A, 50 kA, CU Busbar
ACB
800 A
50kA
MCCB
630 A
35kA
MCCB
400 A
35kA
MCCB
400 A
35kA
800/5,5 A
630/5,5 A
400/5,5 A
400/5,5 A
A