



CI-0703

TAB 7: TECHNICAL DISCIPLINES

Electrical

- > Receptacles shall also be provided for tenants and vending machines as required; and
- > Communications room - minimum of 4 receptacles with 2 on emergency power.

SWITCH GEAR, SWITCHBOARDS AND PANEL BOARDS

GENERAL (TBD)

SWITCHBOARDS

All components of the completed assembly shall be CSA approved and bear a CSA label.

Dimensional coordination: Verify that dimensions for switchboard do not exceed space provided.

Construction and Ratings:

Factory assembled, dead front, metal enclosed and self-supporting switchboard. Complete with line and load side terminations. Bus material to be copper, silver plated. Bus Bracing minimum 65 kA RMS.

Enclosure: CSA Type 2, Indoor use equipped with arc flash reduction protection. Control compartments to be installed on front of the board away from buses.

Future Provisions: Fully equipped spaces for future devices with bussing and bus connections suitably braced for short circuit currents. Allow for 25% spare breakers on new installations.

Monitoring and Metering:

Provide dedicated digital monitoring meters system and sub-meters c/w remote communication capability and capable of storing data for minimum 3 years.

Service Entrance Circuit Breakers:

Provide Sensor and trip plug, solid state trip circuit breakers, 100% continuous duty rating, factory mounted.

Trip Unit Functions:

Adjustable:

- long time ampere rating;
- long time delay;
- short time pick up;
- short time delay;
- Instantaneous pick up.



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Ground fault protectors as per OESC requirements.

If ground fault is required on main breakers provide ground fault protections for downstream breakers as well.

PANELBOARDS

Shall be flush or surface mounted as required, complete with hinged locking door and flush catch, and finished with corrosion-resistant primer, equipment gray. Surface mounted panelboards shall be installed on unistrut galvanized steel framing channels with 75mm clear between back of panelboard and wall. Where practical, panelboards shall be grouped in proximity.

Panelboard shall be copper bus type, with full capacity solid neutral design and sequence style bussing, composed of an assembly of bolt-in-place moulded case circuit breakers with thermal and magnetic trip and trip-free position separate from either the "ON" or "OFF" positions. Multi-pole circuit breakers shall have common simultaneous trip.

Overcurrent devices feeding emergency equipment shall be located only in electrical equipment rooms, and fitted with breaker locking devices.

Provide 30% spare breakers in panel; Allow for 30% spare Amp capacity and spaces in each panel.

Panel boards shall be provided with type-written directories indicating loads controlled by each circuit installed in metal framed clear acetate cover, affixed to the inside cover of the panel board.

Provide panels that will allow the monitoring and control of each circuit. The CT/PT, transducers, relaying, to be able to send information by means of a network connection and address system to both a local and remote communication to power monitoring system.

For retrofit panels, provide relays, CT's and PT's in a relay control panel as close as possible to the power meter monitoring system which is connected to the local and remote communication to power monitoring system.

Provide dedicated relay panel, smart panels, powerlink panels, multi circuit monitoring panel or equivalent, for circuit control, energy saving and monitoring capability. Requirements to be established on site by site basis together with Metrolinx.

SWITCHGEAR

All components at the completed assembly shall be CSA approved and bear a CSA label.

Dimensional Coordination: Verify that dimensions of switchgear do not exceed spaces provided.

Construction and Ratings



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Use arc-resistant, metal-clad switchgear, free standing, dead-front steel structure. Vendor shall provide details describing that arc-resistant testing of equipment.

The switch gear assembly shall be suitable for bolting each cell to steel rails embedded in concrete floor of a substation building.

Sheet steel barriers shall be provided between the vertical units and between the control compartments and the power compartments.

The switchgear shall be suitable for the future additions of units at each end.

A copper ground buss shall be installed for the entire length of switchgear, affording connection to all units and equipped with solderless #2/0-4/0 cable connectors at each end. Bus material to be copper, silver plated.

For outdoor units provide waterproof and tamper proof equipment.

Space heaters 240 volts, operated at 120 volts.

Meters, indicating lights, protective relays shall be mounted on the front of the switchgear panels and arranged in an approved, logical, symmetrical manner. Meters and readout devices shall be mounted at eye level (approx. 5'-6" A.F.F.).

Digital Metering and Relaying: Provide dedicated power monitoring meters system and sub-meters c/w remote communication capability and capable of storing data for minimum 3 years.

POWER CIRCUIT BREAKERS

The power circuit breakers shall be 3 pole, single throw, vacuum break, draw-out type, 5 cycle operation, with self-aligning primary and secondary disconnecting devices.

the breakers shall be 100% continuous duty, 5 cycle operation maximum. Each breaker shall be equipped with "stored energy operation" type, anti-pump operating mechanism. It shall be possible to open and close all breakers manually. Remote operation of each breaker from a remote control panel. OPEN and CLOSED complete with visual verification (indicating light). breakers to have capability of lock out, tag out, locked in open position.

The draw out mechanism shall hold breaker rigidly in the fully connected, and full test/disconnect position, with the door closed. Breaker shall be capable of being locked in the test/disconnect position. Breaker cell door handle shall be capable of being locked in the door closed position.

Interlocks shall be provided that will prevent disconnecting the breaker from the bus stabs or inserting the breaker into the bus stabs unless the breaker is in the tripped (open) position. Interlocks shall be provided to only allow installation of the properly rated breakers in the appropriate rated cells.

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Voltage surge, lightning, phase overcurrent and ground fault protection shall be provided as required.

For load protection other than motors use moulded case circuit breakers with thermal-magnetic trip technology wherever possible. Limit the use of electronic trip technology to situations where flexibility and coordination in circuit protection is necessary.

Only bolt-on circuit breakers may be used in panel boards.

MOTOR CONTROL / MOTOR CONTROL CENTRES

In general, circuit breaker type combination starters in Motor Control Centres shall be used for 600 volt motors. However, individually mounted circuit breaker type combination starters may be used where practicable. All starters shall be magnetic, full voltage start, single speed, non-reversing type (except when the driven equipment characteristics or power company limitations require other types), and shall be equipped with an additional one open and one normally closed contact for possible remote status indication at the Motor Control Centre. Each starter shall be equipped with 120 volt transformer and three thermal overload relays. To be able to be monitored, solid state overload relays to be equipped with controller capable of remote communication.

Each motor starter shall have stop and start button and/or hand/off/auto switch with indicator lights. A local heavy-duty unfused isolating disconnect shall be provided within sight of the motor to safely disconnect equipment for servicing.

The power for the control circuit shall be from the downstream of the breaker supplying power for the motor.

The MCC shall be built-up of vertical sections of the manufacturer's standard dimensions joined together to form a rigid free-standing, dead front structure. There shall be provision for future extension at both ends of each MCC and extension openings shall be covered with removable steel cover plates. Back to back MCC's sharing common horizontal and vertical bus shall not be allowed.

The rear of each vertical single sided power section shall have a bolted steel cover plate. All components shall be accessible from the front. The overall height of the MCC shall be approximately 2286 mm (90 inches), exclusive of the channel base and lifting angles.

Each MCC shall be provided with a steel channel base extending along the front and back of the MCC, complete with bolt holes for the purpose of bolting the motor control centre to the floor.

Horizontal control wiring trough shall be provided at the top and bottom of each section such that when sections are fastened together, they shall form continuous wireway that extend the full length of the control centre. Each vertical section shall be provided with an individual full-height wiring trough, which shall connect to the horizontal troughs at the top and at the bottom. Access to this trough shall be through a hinged door having captive type fastening. These wireways shall, when in service, provide complete isolation from all 600V bus and terminations and shall provide sufficient space to easily accommodate all power and/or control cables related to that section.

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Dead front bus barriers are required. The vertical bus shall have automatic shutters that isolate the bus from accidental contact when starters/wrappers are withdrawn. Blank sections, or future spaces, shall have similar barriers complete with removable covers for the bus stab openings. Each phase of the vertical bus shall be isolated and insulated from each other and form the front and rear compartments.

Where specified, "back to back" construction will consist of two standard single front access units mounted back to back with a double steel wall between the front and back unit. The front and back units shall have two separate buses and be provided with a bus interconnection link so that either side of the unit may be disconnected from the incoming cables.

The total Motor Control Centre assembly shall have a current fault rating according to short circuit calculation, unless specified otherwise on the MCC specification. In addition, all main and vertical buses shall be braced to withstand stresses developed by fault currents of minimum 42,000 amperes RMS symmetrical, verify with short circuit calculation.

For layover sites use 1200A rated MCC.

Provide MCC with arc flash reduction protection complete with pressure relief system, arc containment door latches, insulated power bus plates at the ends of each MCC line-up.

The incoming power supply cables shall enter either at the top or the bottom, as shown on the consultant drawings.

Provide top hat or bottom entry cabinet for service feeds.

Sufficient space shall be provided in the incoming section for the supporting and the termination of these incoming power cables.

Suitable compression type terminal lugs (YA hylug or equivalent) shall be provided. Lugs shall be long barrel, minimum two hole NEMA compression type for copper conductors. All connectors shall be provided. Each 3 phase connection shall be supplied with a reusable form fitting indoor insulating boot, suitable for voltage level application.

Digital Metering devices shall be housed in a separate compartment having no exposure to the 600 Volt bus or terminations. Metering compartments shall be installed such the metering unit is viewable at approx. 5' –6".

Metering shall be as specified on specification sheet. In addition, each MCC shall have an incoming Power Measurement meter. The meter shall be complete with Modbus RTU communications module, and 2 PT's and 3 CT's. Provide fuse blocks for PT's and shorting blocks for CT's.

Only dead front fuse holders shall be utilized in metering circuits.