

Part 1 General

1.1 SECTION INCLUDES

- .1 Integrated Power Center 'IPC' – Furnish and install an integrated solution as specified herein and where shown on the associated drawings.
- .2 The section shall include:
 - .1 Main Service Section
 - .2 Main Disconnect Device
 - .3 Utility Metering Compartment
 - .4 Power Distribution Interior
 - .5 Dry Type Transformer
 - .6 Lighting and Appliance Panel Interiors
 - .7 Individually Mounted Circuit Breakers
 - .8 Customer Metering
 - .9 TVSS Devices
 - .10 Third Party Equipment

1.2 REFERENCES

- .1 The equipment referenced herein shall be designed and manufactured according to the latest revision of all applicable standards, codes or specifications, including the following: Note standards may be met through harmonization of the corresponding UL Standards.
 - .1 CSA 22.2 No. 94.1 – Standards for enclosures for electrical equipment
 - .2 CSA 22.2 No. 29 – Standards for panelboards
 - .3 CSA 22.2 No. 14 – Standards for Industrial Controls
 - .4 CSA 22.2 No. 31/244 – Standards for switchboards
 - .5 CSA C22.2 No. 5 - Molded Case Circuit Breakers

1.3 SUBMITTAL AND RECORD DOCUMENTATION

- .1 Approval documents shall include drawings. Drawings shall contain overall switchboard enclosure dimensions. The location of the main, branches, and solid neutral shall be shown clearly. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems. Record drawings shall be made available to the customer through electronic transmission. The customer may request any of the following formats: DXF, DWG or PDF.

1.4 QUALIFICATIONS

- .1 Company specializing in assembly of integrated equipment with a minimum of twenty-five (25) years documented experience.
- .2 Panelboards shall be manufactured in accordance with standards listed in "References". Operating voltages: to CAN3-C235.
- .3 The company that assembles and provides the integrated equipment enclosure(s) shall be the same company that manufactures the panelboards, circuit breakers and dry type transformers.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Inspect and report concealed damage to carrier within their required time period.
- .2 Handle carefully to avoid damage to panelboard internal components, enclosure and finish.
- .3 Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris and traffic.

1.6 OPERATIONS AND MAINTENANCE MATERIALS

- .1 Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 – “Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less”.

1.7 WARRANTY

- .1 Manufacturer shall warrant specified equipment free from defects in materials and workmanship for eighteen (18) months from the date of invoice.

Part 2 Products

2.1 MANUFACTURERS

- .1 Shall be Square D by Schneider Electric ‘IPC-2’, or approved equal in accordance with B7. Substitutions must be submitted in writing with supporting documentation demonstrating that the alternate manufacturer meets all aspects of the specification herein.

2.2 RATINGS

- .1 600Y/347, 120Y/208 volt power panels, lighting panels, individually mounted circuit breakers, shall be rated to withstand mechanical forces exerted during short circuit conditions when connected to a power source having an available fault current of 42,000 amperes symmetrical at rated voltage as shown on the drawing Control wiring and conduit below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.
- .2 The short circuit current rating of section shall be limited to the lowest short circuit rating or series connected rating of any installed device in that section.
- .3 The equipment shall be suitable for and certified to meet applicable seismic requirements of the Canadian National Building Code (NBC), International Building Code (IBC), 2009 ICC Edition and ASCE 7-02, or later, for the site-specific location. Guidelines for the installation shall be provided by the equipment manufacture and based on testing of representative equipment. Equipment capacity shall be determined from tri-axial seismic shake table results as defined in ICC ES AC 156.

2.3 ENCLOSURES

- .1 Enclosure: Type 1 - General Purpose 1 With Drip Hood
 - .1 Enclosures shall be constructed in accordance with UL 891/ CSA 22.2 No. 244 requirements.
 - .2 Sections shall be aligned front and rear.
 - .3 Removable steel base channels (1.5 inch floor sills) shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.
 - .4 Enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.
 - .5 All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.
 - .6 Each line up shall consist of the required number of vertical sections bolted together to form a rigid assembly.
 - .7 Sections shall allow for top and/or bottom cable entry and exit.
 - .8 Single section shipping splits shall not exceed 48 in. (1218 mm) wide maximum.
 - .9 Multiple section shipping splits shall not exceed 96 in. (2438 mm) wide maximum.

2.4 BUSSING

- .1 The Integrated Power Center switchboard bussing shall be silver-plated copper.
- .2 The through bus shall have a maximum ampacity of 2,000A. The bussing shall be of sufficient cross-sectional area to meet the CSA C22.2 No. 31 standard for temperature rise.
- .3 The IPC Switchboard shall be rated with a minimum short circuit rating of 35,000A at 600Vac
- .4 Provisions shall be made for future splicing of additional sections.
- .5 The utility metering compartment shall have provisions for [window type] [bar type] current transformers as supplied by the applicable public utility.
- .6 Factory provided power cables shall be used by the installer to connect the transformer to the distribution section.

2.5 MAIN DISCONNECT DEVICES

- .1 Main Circuit Breaker shall be electronic trip molded case, full function, circuit breaker
 - a. Shall be rated for 80% continuous current and be Square D PowerPact R style breaker with MICROLOGIC trip system.
 - b. Rated ampacity shall be 2,000A
 - c. Circuit breaker trip system shall be a MICROLOGIC electronic trip unit:
 - .1 All trip units shall be removable to allow for field upgrades.

- .2 Trip Units shall incorporate “True RMS Sensing”, and have LED long-time pickup indications.
- .3 MICROLOGIC trip unit functions shall consist of adjustable long-time pickup and delay, short-time pickup and delay, instantaneous and ground-fault pickup and delay.
- .4 Adjustable long-time pickup (I_r) and delay shall be available in an adjustable rating plug that is UL Listed as field-replaceable. Adjustable rating plug shall allow for nine long-time pickup settings from 0.4 to 1 times the sensor plug (I_n). Other adjustable rating plugs shall be available for more precise settings to match the application. Long-time delay settings shall be in nine bands from 0.5–24 seconds at six times I_r .
- .5 Short-time pickup shall allow for nine settings from 1.5 to 10 times I_r . Short-time delay shall be in nine bands from 0.1–0.4 I 2 t ON and 0–0.4 I 2 t OFF
- .6 Instantaneous settings on the trip units with LSI protection shall be available in nine bands from 2 to 15 times I_n . The Instantaneous setting shall also have an OFF setting when short-time pick-up is provided.
- .7 All trip units shall have the capability for the adjustments to be set and read locally by rotating a switch. [Optional: trip units shall have the capability to electronically adjust the settings locally and remotely to fine increments below the switch settings. Fine increments for pickup adjustments are to be one ampere. Fine increments for delay adjustments are to be one second.]
- .8 Trip unit shall provide local trip indication and capability to indicate local and remote reason for trip, i.e., overload, short circuit or ground fault.
- .9 Ground-fault protection shall be available for solidly grounded three-phase, three-wire or three-phase, four-wire systems. Trip unit shall be capable of the following types of ground-fault protection: residual, source ground return, and modified differential. Ground-fault sensing systems may be changed in the field.
- .10 Ground-fault settings for circuit breaker sensor sizes 1200 A or below shall be in nine bands from 0.2 to 1.0 times I_n . The ground-fault settings for circuit breakers above 1200 A shall be nine bands from 500 to 1200 A.
- .11 Trip units shall be available to provide additional protection by offering adjustable inverse definite minimum time lag (IDMTL). IDMTL provides optimized coordination by the adjustment of the slope of the long-time delay protection.
- .12 Trip units shall be available to provide real time metering. Metering functions include current, voltage, power and frequency. Metering accuracy shall be 1.5% current, 0.5% voltage, and 2% power. These accuracy’s shall be total system including CT and meter.

2.6 METERING

- .1 Metering shall be Square D PowerLogic 5000 series.
- .2 The metering device used to monitor circuits for purposes of network management, energy cost management, energy allocation, and operational efficiency shall have the following minimum features:
 - .1 Connections and form factor - direct connect to circuits up to 600 VAC, eliminating the need for voltage (potential) transformers; five (5) amperes (A) nominal current inputs. Removable connectors for voltage inputs, control power, communications, inputs and outputs; easily mountable in the pre-made cutout without tools; form factor shall be ¼ DIN with 92 X 92 cut-out and 96 x 96 panel mount integrated display.
 - .2 Supported monitoring parameters—full range of 3-phase voltage, current, power and energy measurements, power factor, frequency, total harmonic distortion (THD), individual power harmonics (up to 63rd order).
 - .3 Accuracy standards - use four-quadrant metering and sample current/voltage simultaneously without gaps with 64 samples per cycle (zero bling); comply with ANSI C12.20 class 0.2 and IEC 61557-12 class 0.2 for revenue meters.
 - .4 Display - Backlit dot-matrix LCD display, anti-glare and scratch resistant with a minimum of 128 x 128 pixels, capable of displaying four values in one screen simultaneously; a summary screen to allow the user to view a snapshot of the system; support either integrated or remote display.
 - .5 Support four (4) digital inputs for Demand Synch Pulse, Time Synch Input, and Conditional Energy Control; have two (2) digital outputs that operate either by user command sent over communication link, or in response to a user defined alarm or event.
 - .6 Communications - serial RS-485 Modbus, Ethernet Modbus TCP, and Ethernet BACnet IP (BTL certified); provide two Ethernet ports to allow wiring from meter to meter as a daisy-chain; be capable of serve data over the Ethernet network accessible through a standard web browser; the monitor shall contain default pages from the factory.
 - .7 Onboard data logging capabilities - to log data, alarms and events; logged information will include data logs, minimum/maximum log files of selected parameter values, and alarm logs for each user defined alarm or event log; support the following on-board nonvolatile memory—14 parameters every 15 minutes for 90 days.
 - .8 Alarming capabilities - support 29 set-point driven alarms, four (4) digital alarms, (4) unary alarms, 10 Boolean alarms and five (5) custom alarms; user definable alarm events; set-point driven alarms shall be available for voltage/current parameters, input status, and end of interval status.
 - .9 Firmware-upgradeable to enhance functionality through the Ethernet or serial communication connection and shall allow upgrades of individual meters or groups.

- .10 Integrated gateway functionality, enabling the capability to connect via Ethernet to downstream, serially connected devices if specified.

2.7 DISTRIBUTION SECTION DEVICES

A. Circuit Breakers Group Mounted:

- .1 Breakers and all components shall be designed, manufactured and tested in accordance with applicable UL and CSA standards.
- .2 Circuit breaker(s) shall be rated for 80% continuous current. Circuit breakers shall be CDP-type PowerPact as manufactured by Schneider Electric, with thermal-magnetic or MICROLOGIC® electronic trip units as specified on the associated drawings. Circuit breakers shall have voltage and interrupting ratings that meet the application requirements.
- .3 Circuit breakers(s) shall have 35 kA interrupting capacity at 600Vac. Two tier CSA or UL listed series ratings are acceptable. When series ratings are applied with integral or remote upstream devices, a label or manual shall be provided showing the CSA or UL approved series ratings including:
 - Voltage
 - Size and type of upstream fuses or breakers
 - Size and type of branch devices that can be used
- .4 Circuit breaker(s) shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
- .5 The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
- .6 Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
- .7 All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

B. Trip Units:

- .1 The metering used to monitor circuits for purposes of network management, energy cost management, energy allocation, and operational efficiency shall be integral to the circuit breaker.
- .2 All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.
- .3 Circuit breaker trip system shall be a microprocessor-based true RMS. Sensor ampere ratings shall be as indicated on the associated drawing.

- .4 Local visual trip indication for overload, short circuit and ground fault trip occurrences.
- .5 Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.
- .6 Communications capabilities for remote monitoring of circuit breaker trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings, and trip history information shall be provided as required by diagram.
- .7 Trip unit shall provide local trip indication and capability to locally and remotely indicate reason for trip, i.e., overload, short circuit, or ground fault.
- .8 Neutral current transformers shall be available for four-wire systems.
- .9 Trip units shall have the capability to be electronically adjusted the settings locally and remotely to fine increments below the switch settings. Fine increments for pickup adjustments shall be 1 ampere. Fine increments for delay adjustments shall be one second
- .10 Trip units shall be available to provide real time metering. Metering functions shall include, but shall not be limited to, the following:
 - a. Current (phases, neutral, average, maximum).
 - b. Voltage (phase-to-phase, phase-to-neutral, average, unbalance).
 - c. Power (active [kW], reactive [kVAR], apparent [kVA], power factor).
 - d. Energy (active [kWh], reactive [kVAR], apparent [kVA]).
 - e. Frequency.
 - f. Total harmonic distortion (current, voltage).
 - g. Metering accuracy shall be 1.5 percent current (above 600A), 1.0 percent current (600A and below), 0.5 percent voltage, and 2 percent energy. These accuracy's shall be total system, including, but not limited to, CT and meter.
- .11 Measurement chain shall be independent from the protection chain.
- .12 The measurements shall be displayed on the breaker itself and/or on a remote display and/or on a remote system via Modbus communication.
- .13 Connections from circuit breaker to remote display and/or communication module shall be plug-n-play via RJ45 connector No special tools or programming shall be required.
- .14 Optional features for applications 600A and smaller, choose all that apply:
 - a. Zone Selective Interlocking
 - b. Contact wear indication
 - c. Operation, trip and alarm counters
 - d. Operating hours counter
 - e. Load profile
- .15 Optional features for applications above 600A, choose all that apply:
 - a. Inverse definite minimum time lag (IDMTL)
 - b. Zone selective interlocking
 - c. Protective relaying functions (Current unbalance, maximum demand current, reverse power, etc)

- d. Phase loading
- e. Contact wear indication
- f. Wave form capture
- g. Data logging

C. Accessories:

- .1 Circuit breakers shall be equipped with cUL-listed electrical accessories as noted on the drawings or schedules or they may be field-installable.
- .2 The addition of auxiliaries shall not increase the volume of the circuit breaker.

2.8 FRONTS

- .1 Trim front shall meet strength and rigidity requirements of applicable CSA/UL standards.
- .2 The manufacturer shall provide a hinged door with a key lock over the dead-front of each panelboard interior.
- .3 All panelboards shall have door-in-door construction.
- .4 All individually mounted circuit breakers and/or equipment space compartments shall have a full width hinged door. The hinged door shall be secured with captive screws.
- .5 The transformer front cover shall be secured with screws.
- .6 Directory cardholder with typed circuit directory shall be included with each panel interior.

2.9 WIRING / TERMINATION

- .1 Factory installed type THHN copper power cables shall electrically connect the transformer to the power panel interior or lighting and appliance panel interiors in the section or lineup.
- .2 All control wire shall be type [MTW], [SIS] bundled and secured with nylon ties.
- .3 Wire markers shall be provided at each end of controlled branch circuits for lighting contactors (line side wiring only)
- .4 When shipping splits are required, power cables shall be cut to length, stripped, labeled and rolled back in one of the adjacent enclosures. Control wiring that bridges shipping splits shall be provided with male/female connectors.

2.10 PANEL INTERIORS

- .1 Panel interiors shall be flush mounted with the front of the enclosure to allow easy access to line and/or load conductor's entering/exiting top or bottom. Recessing the panel interior more than 3 inches from the front of the enclosure will not be acceptable.
- .2 Power panel interiors shall be Square D I-LINE circuit breaker type rated 600 Vac maximum – Refer to product specification 16440-3.3 to obtain interior and circuit breaker specifications.

- .3 Lighting and Appliance panel interiors shall be NQ circuit breaker type rated 240 Vac maximum - Refer to product specification 16440-3.2 to obtain interior and circuit breaker specifications.
- .4 Lighting and Appliance panel interiors shall be NF circuit breaker type rated 480Y/277 Vac maximum - Refer to product specification 16440-3.1 to obtain interior and circuit breaker specifications.

2.11 INDIVIDUALLY MOUNTED CIRCUIT BREAKERS

- .1 Individually mounted molded case circuit breaker cell shall have a door to access the wiring compartment.
- .2 Individually mounted molded case circuit breaker handles shall be accessible from the front of the section without opening a door.
- .3 Circuit breaker options shall include shunt trip

2.12 TVSS UNITS

- .1 Integrated surge protective devices shall be Listed and Component Recognized in accordance with UL 1449 Fourth Edition to include Section 37.3 highest fault current category. SPD shall be UL 1283 listed.
- .2 Each mode including N-G shall be fused with a 200kA UL recognized surge rated fuse and incorporate a thermal cutout device. SPD shall safely reach an end of life condition when subjected to fault current levels between 0 and 200kA, including low level fault current from 5 to 5000 amperes.
- .3 SPD devices in the NQ and NF lighting and appliance panel interiors shall be bus connected.
- .4 I-LINE power panel interiors shall have a SPD unit that is branch breaker connected.
- .5 Audible diagnostic monitoring shall be by way of audible alarm. The alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided. Provide a set of dry contacts for remote diagnostic monitoring capability as standard. Strike counter and remote strike monitoring shall be provided as an option when shown on the drawings.
- .6 See the associated drawings for SPD surge current ratings.
- .7 SPD devices shall be free from defects for a period of ten (10) years from the date of invoice by the manufacture or its authorized sales channel.
- .8 SPD devices shall be Square D Model EMA, IMA or HWA for service entrance, power distribution, and lighting and appliance panelboard applications. - Refer to product specification 164280-1.2 for in depth SPD specifications.

2.13 INTEGRATED TRANSFORMERS

- .1 Shall be Square D by Schneider-Electric Energy Efficient dry type lighting transformers or approved equal in accordance with B7.

- .2 Transformer coils shall be copper wound construction and shall be impregnated with non-hygroscopic thermosetting varnish.
- .3 Transformer(s) shall be factory installed in a freestanding enclosure as shown on the associated drawings.
- .4 Transformers shall be Square D by Schneider-Electric type or approved equal in accordance with B7 with the kVA rating as specified on the drawings. - Refer to product specification 26 12 17 to obtain general lighting and distribution transformer specifications.
- .5 Fan cooled transformers will not be allowed.
- .6 An Energy Efficient transformer in combination with a panelboard, individually mounted circuit breaker or lighting controls, shall not exceed 300kVA 150° C Rise. 115°C, 80°C or K-Factor are available options but may change the maximum kVA rating.
- .7 Energy Efficient stacked transformers shall not exceed 112.5kVA over a 150kVA 150° C Rise. 80°C or K-Factor are available options but may change the maximum kVA rating.

Part 3 Execution

3.1 INSTALLATION

- .1 Install the Integrated Power Center in accordance with manufacturer's written instructions, NEMA B 2.1 "Proper Handling, Installation, Operation and Maintenance of Dead-front Switchboards Rated 600 volts or Less" and CEC / NEC standards.

3.2 FIELD QUALITY CONTROL

- .1 Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.
- .2 Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

END OF SECTION