

## **SECTION [26 24 16] [16740] Panelboards**

### **ABB ReliaGear SafeT Panelboards**

#### **PART 1: GENERAL**

##### **1.01 SCOPE**

- A. The requirements of the Contract, Division [26 24 16] applies to work in this section. Low voltage power distribution panelboards as specified and as shown on the contract drawings shall be furnished and installed by the Contractor.

##### **1.02 REFERENCES**

- A. Panelboards shall be designed, manufactured and tested in accordance with the following standards and guidelines. These documents are references only and shown by basic designation. The edition/revision of the referenced documents shall be the latest as of the date of the contract documents, unless otherwise specified.
  1. UL 50, Enclosures and Electrical Equipment
  2. UL 67, Panel boards
  3. NEC 408
  4. NEMA PB 1 - Panelboards
  5. NEMA PB1.1-2013, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less
  6. ANSI/NFPA 70, National Electrical Code
  7. CSA C22.2, No. 29-15 standard for panel boards and enclosed panel boards – Canadian Market
  8. Federal Spec W-P 115, Rev-C
  9. Federal Specification W-C-375B/Gen-Circuit Breakers. Molded Case, Branch Circuit and Service
- B. Main and Branch Circuit Breakers used in ABB Panelboards shall be designed, manufactured and tested in accordance with the following:
  1. UL 489, Molded Case Circuit Breakers and Circuit Breaker Enclosures
  2. NEMA AB1, Molded Case Circuit Breakers
  3. CSA Standard C22.2 No. 5-16 standard for Molded Case Circuit Breakers
  4. American Bureau of Shipping
- C. [Related Sections include the following]:
  1. Section [26 28 16] [16410] – Enclosed Circuit Breakers
  2. Section [26 43 13] [16289] – Transient-Voltage Suppression For Low-Voltage Electrical Power Circuits
  3. Section [26 08 00] [16xxx] – Commissioning of Electrical Systems]

##### **1.03 SUBMITTALS**

- A. The Contractor shall provide the following information for review and evaluation by the Engineer:
  1. Shop Drawings showing circuit breakers, dimensions, Interior mounting dimensions, wiring gutter sizes, voltage, phasing, continuous current capacity, and short circuit rating. Also include one-line system drawing with the applicable system and voltage.
  2. Conduit entry location, cable termination sizes, mounting.
- B. The Contractor shall provide final, as- built drawings, recording the actual circuiting of panels. Installation, Operation and Maintenance manuals shall be supplied.

##### **1.04 QUALIFICATIONS**

- A. The manufacturer of the UL labeled panelboard design shall be the same manufacturer of the major components contained within the panelboard sub-assembly, such as the molded case circuit breakers.
- B. The manufacturer of this equipment shall be ISO 9001.
- C. The manufacturer shall have certification to ISO 14001.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be properly packed for delivery and shipped in original factory labeled wrapping and packaging, clearly marked on the outside wrapping for site identification.
- B. Equipment shall be received, stored and handled in strict compliance with manufacturer's instructions and recommendations and protected from potential damage from weather and construction operations. Equipment shall be stored so condensation will not form on or in the panelboard. Instructions shall be included with each panelboard as shipped.

#### 1.06 OPERATION AND MAINTENANCE MATERIALS

- A. Equipment operation and maintenance manuals shall be provided with each panelboard and shall include the following:
  - 1. Provide certification letter for [UL], [cUL] listing
  - 2. ReliaGear SafeT Panelboard Installation and Maintenance Guide
  - 3. NEMA Standards Publication PB 1.1

#### 1.07 WARRANTY

- A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

### PART 2: PRODUCTS

#### 2.01 MANUFACTURERS

- A. [The panelboards shall be ReliaGear SafeT Panelboards manufactured by ABB.]
- B. Approved manufacturers are as follows:
  - 1. *ABB*
  - 2. *[]*
  - 3. *[]*

#### 2.02 RATINGS

- A. The system shall be rated to 600VAC Maximum
- B. The main bus ampacity of the panelboard shall be fully rated to the following: [1200A], [1000A], [800A], [600A], [400A].
- C. The system shall be designed for use on [60Hz], [50 Hz] electrical systems.
- D. The systems shall be able to be used in [3-Phase 3-Wire] or [3-Phase 4-Wire] electrical systems.
- E. The panelboard stand-alone assembly shall be rated to withstand mechanical forces during short-circuit conditions when connected to a direct power source having an available fault current of [65kA]
- F. The short circuit current rating of the system shall be determined by the available fault current at the panelboard. All interrupting ratings shall be accomplished without the use of current limiting fuses.
- G. All circuit breakers shall have a minimum short circuit interrupting capacity of: [18kA], [22kA], [25kA], [35kA], [42kA], [50kA], [65kA], [100kA], [150kA], [200kA].
- H. The panelboard shall be Suitable for Use as Service Entrance per NEC by bonding the neutral to ground when required

#### 2.03 COMPONENTS

Panelboards shall be as shown on the drawings and schedules. Refer to drawings for details regarding location of components, voltage and current rating of devices and other required details.

- A. Interior
  - 1. Shall be ABB ReliaGear SafeT Panelboard interiors in accordance with specified ratings
  - 2. The panelboard interior shall be a [Main Circuit Breaker (MCB)], [Fixed Main Lug Only (MLO)], [Universal Back Feed] configuration
  - 3. The interior will provide UL Listed short circuit current ratings not to exceed the lowest short circuit rating of any circuit breaker installed, up to a maximum of 200kA.
  - 4. Interior shall be field reversible from top to bottom feed and vice-versa.
  - 5. The interior bus stack shall have three flat bus bars aligned vertically. The bus shall be braced and insulated to achieve specified ratings. The complete distribution bus stack

- plug-in openings shall be shrouded to provide IP20 protection per IEC 60529, even with branch devices disconnected and with front covers removed from the panelboard.
6. Circuit breaker bus side connections (BSC) to main bus shall be plug-on jaw-type and held in place by 1 or 2 fastening screws, and shall not require annual torque inspection.
  7. No additional hardware including loose screws, bolts, nuts, or washers shall be required to connect branch circuit breakers.
  8. It shall be possible to mount circuit breakers of different frame sizes adjacent to or across from one another.
- B. Bussing
1. Shall be Silver Flashed Copper, Tin Plated Copper rated up to 1200A, or Tin Plated Aluminum rated up to 600A in accordance with UL 67 standards for temperature rise.
- C. Ground Bars
1. An [isolated] [non-isolated], [aluminum] [copper] equipment ground bar will be provided.
- D. Solid Neutrals
1. [Solid Neutral shall have a lug for each outgoing branch requiring a neutral connection; load side neutral connection lugs shall be [100%] [200 %]. Bonding strap for service entrance applications shall be available.
- E. Enclosure
1. NEMA Type 1 Enclosures shall be fabricated from galvanized steel, protected against corrosion per the requirements of NEMA 250 and UL 50. Box or panel interior shall have means for leveling and flush adjustment. Removable end walls to be blank.
  2. NEMA Type 1 Trims:
    - a. Trims for Power distribution shall be [surface] [flush applications consult factory] [as indicated on the drawings]. Trims shall be fabricated from cold-rolled steel, painted with an ANSI-61 light gray finish and equipped with hinges and circuit directory cardholder.
    - b. Dead front trims shall be split front type, hinged to the back box as standard, to allow independent access to either the Main incoming section or Branch Breaker section or both sections simultaneously.
    - c. Trim sections shall include:
      - (i) Top Vent Panel – Screwed directly onto Back box
      - (ii) Main Incoming Section Panel – Hinged to Back Box (Only used on Fixed Vertically Mounted MLO and MCB)
      - (iii) Branch Device Front frame – Hinged to Back Box (Individual branch device covers and blanks for unused space mount directly to this frame)
      - (iv) Bottom Vent Panel - Screwed onto Back box.
  3. Optional lockable doors
    - a. Shall be available installed over the Main and Branch sections if called for on the drawings or schedules.
- F. Molded Case Circuit Breakers
1. Circuit Breakers shall be ABB SACE Tmax or Tmax XT molded case circuit breakers.
  2. Molded case circuit breakers shall be provided as standard with either a factory assembled or a field installable bus side connector (BSC) to provide a plug-on IP20 protected connection to the bus bars.
  3. Circuit Breaker bus side connector (BSC) connections shall be rated to 600 volts and up to 1200 amperes maximum, and shall be designed to be IP20 per IEC 60529, even with the front covers removed from the panelboard.
  4. Short circuit rating shall be fully rated as per the schedule and drawings, but not less than 10kAIC at 240 VAC or 14kaic at 480 VAC.
  5. Molded case circuit breakers shall be of the quick-make, quick-break, trip-free, [thermal magnetic] [solid state] type. If thermal magnetic they shall have fixed (TMF) or adjustable (TMA) ratings as shown on the drawings or schedules. If solid state they shall have LS/I, I, LSI, LSIG trip functions as shown on the drawings or schedules. See the tables below for available trip units that shall be available. Breaker trip ratings shall be as shown on the drawings or schedules.

Table 1. Trip Units

| Breaker Frame | Ampacity | Trip Unit Type |     |      |   |     |      |
|---------------|----------|----------------|-----|------|---|-----|------|
|               |          | TMF            | TMA | LS/I | I | LSI | LSIG |
| Tmax XT1      | 125      | x              |     |      |   |     |      |
| Tmax XT2      | 125      |                | x   | x    | x | x   | x    |
| Tmax XT3      | 225      | x              |     |      |   |     |      |
| Tmax XT4      | 250      | x              | x   | x    | x | x   | x    |
| Tmax T5       | 400      |                | x   | x    |   | x   | x    |
| Tmax T6       | 800      |                | x   | x    |   | x   | x    |
| Tmax T7       | 1200     |                |     | x    |   | x   | x    |

6. The plug-on type circuit breakers shall be capable of installation without disturbing adjacent branch breakers.
7. Multi-pole breakers shall be common trip.
8. Provide circuit breaker accessories as indicated on the drawings or panel schedules.
9. Breaker accessories such as shunt trip, undervoltage release, and auxiliary contacts shall be imbedded in the breaker, and shall not require the use of any additional circuit breaker mounting space on the bus stack.
10. It shall be possible to mount circuit breakers of different frame sizes adjacent to or across from one another.
11. All unused "spaces" in panelboards, unless otherwise specified, shall accept additions of future circuit breakers without added hardware or connectors.
12. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF in addition to providing International I/O markings.
13. A marking shall be located on the face of each circuit breaker denoting the maximum rated current, applicable voltages with corresponding short circuit ratings, and UL certification.
14. Maintenance mode
  - a. Functionality shall be available for MCCB's, and shall be provided where required by 2014 NEC, and as indicated in the contract documents.
15. The rated mechanical life of the breaker shall be no less than:

Table 2. Breaker Mechanical Life

| Breaker Frame | Ampacity | # of Operations |
|---------------|----------|-----------------|
| Tmax XT1      | 125      | 25,000          |
| Tmax XT2      | 125      | 25,000          |
| Tmax XT3      | 225      | 25,000          |
| Tmax XT4      | 250      | 25,000          |
| Tmax T5       | 400      | 20,000          |
| Tmax T6       | 800      | 20,000          |
| Tmax T7       | 1200     | 20,000          |

- G. Plug-on Lugs
  1. Plug-on branch devices shall be available for back feed, sub feed, or feed thru lugs that maintain an IP20 connection to the SafeT Panelboard interior bus stack
  2. Devices shall be in [400A], [800A], and [1200A] frames
- H. Ground Fault Protection

1. Shall be available for MCCB's, shall be provided where required by the NEC, and as indicated on the contract documents.
- I. [Power Monitoring]
  1. Panelboard to have power monitoring capability
- J. Panelboard Surge Protective Devices - See Specification SECTION 16280-1.2 [26 43 00.12] Integrated Surge Protective Device (SPDs) for Panelboards
  1. Surge Suppressors shall be mounted internal to the panelboard enclosure unless the required rating is in excess of 160KA.
  2. The unit shall be UL 1449 4th Edition Type 1 Listed Surge Protective Device and UL 1283 Listed.
    - a. Comply with IEEE C62.41.1 and .2 and test devices according to IEEE C62.45.
    - b. Only UL Type 1 devices are allowed, other Types are not acceptable.
  3. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:
    - a. Maximum Continuous Operating Voltage (MCOV) of not less than 640v L-L, 320v L-N for 277/480V and 300v L-L, 150v L-N for 120/208V nominal RMS operating system voltage.
    - b. Operating Temperature: -40 to 158 deg F
    - c. Altitude: Less than 13,000 feet above sea level.
    - d. Operating Frequency 47-63 HZ
  4. Coordination
    - a. Coordinate location of field-mounted SPDs to allow adequate clearances for maintenance and to connect given pre-installed wire lead lengths.
    - b. SPD's shall be IP20 rated when installed internal to the panelboard.
    - c. SPD's shall be applied considering the proper load side voltage and system suitable for application of the device per the manufacturer's ratings and guidelines.
  5. Warranty
    - a. SPD Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fails in materials or workmanship within specified warranty period.
    - b. SPD Warranty Period: 10 years from date of Substantial Completion.
  6. Products shall be ABB Joslyn Type JSPR-120 or 160 unless otherwise approved.
    - a. Audible alarm, with silencing switch, to indicate when protection has failed.
    - b. Form C relay contacts.
    - c. Status indicator lights (one per phase).
    - d. ANSI/UL 1449-2006 Listed.
    - e. Modular design
    - f. Minimum ANSI/UL 1449-2006 withstand (In) rating to be 20kA per mode
    - g. Redundant suppression circuits.
    - h. LED indicator lights
    - i. Audible alarm, with silencing switch, to indicate when protection has failed.
    - j. Form-C contacts
    - k. IP20 rated.
  7. Enclosures
    - a. Interior mounted in the panelboard enclosure up to 160 KA rating and exterior mounted for larger than 160 KA.
  8. Installation
    - a. Install SPDs for panelboards and auxiliary panels with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground unless otherwise indicated.
    - b. The SPDs ground shall be connected to the power system ground.
  9. Startup Service
    - a. Do not perform insulation resistance (MEGGER) tests of the distribution wiring equipment with the SPDs installed. Disconnect all wires, including neutral, before

conducting insulation resistance tests, and reconnect immediately after the testing is over.

K. Nameplates

1. A ratings plate shall be provided for each panelboard with the system voltage, ampacity, short circuit rating, panel designation, factory information, serial number, and UL markings
2. [If Factory Assembled, A phenolic engraved nameplate shall be provided for each panelboard]

2.04 FINISH

- A. The front cover shall be finished ANSI 61 light gray
- B. [Optional] Additional custom paint colors can be provided in order to meet special customer requirements such as matching other equipment].

## PART 3: EXECUTION

### 3.01 INSTALLATION

- A. The successful contractors must install all equipment per the manufacturer's recommendations and per the applicable standards referenced in section 1.06
- B. All equipment under this contract shall be installed and checked in strict accordance with the manufacturer's recommendations as documented in the operation and maintenance manuals.

END OF SECTION