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**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 26 05 00 - Common Work Results for Electrical.

**1.2                REFERENCES**

- .1            American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE).
  - .1            ANSI/IEEE C37.13-2008, Low Voltage AC Power Circuit Breakers Used in Enclosures.
  - .2            ANSI/IEEE, C37.16, Standard for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors, Preferred Ratings, Related Requirements and Application.
  - .3            ANSI/IEEE C37.17, Trip Devices for AC and General Purpose DC Low Voltage Power Circuit Breakers.
  - .4            ANSI/IEEE C37.20.1, Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.
- .2            American National Standards Institute (ANSI)/National Electrical Manufacturers Association (NEMA).
  - .1            ANSI/NEMA C37.50, Standard for Switchgear - Low Voltage AC Power Circuit Breakers Used in Enclosures - Test Procedures.
  - .2            ANSI/NEMA C37.51, Standard for Switchgear - Metal Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies - Conformance Test Procedures.
- .3            CSA International.
  - .1            CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).
- .4            Electrical Equipment Manufacturers Association of Canada (EEMAC).
  - .1            EEMAC G8-3.2, Standard for Metal Clad and Station Type Cubicle Switchgear.
- .5            National Electrical Manufacturers Association (NEMA).
  - .1            NEMA SG-3, Low-Voltage Power Circuit Breakers.
- .6            Underwriters Laboratories (UL).
  - .1            UL 1066, Standard for Safety Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for air circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings:
    - .1 Time-current phase protection co-ordination characteristic curves for breakers.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for air circuit breakers for incorporation into manual.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect air circuit breakers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for recycling packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

#### **1.6 ACCEPTABLE PRODUCTS AND MATERIALS**

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

### **Part 2 Products**

#### **2.1 AIR CIRCUIT BREAKER**

- .1 Air circuit breaker: to ANSI/IEEE C37.13 and CSA C22.2 No.5.
- .2 Draw out type, 600 V class.
  - .1 Continuous current rating: 3,000 A.
  - .2 Trip rating: 2,400 A.

- .3 Interrupting rating: 65 kA, RMS symmetrical.
  - .1 Interrupting rating to be obtained without use of current-limiting fuses.
- .3 Breakers with motor charged, stored energy, quick-make, two-step closing mechanism with emergency manual spring charging handle and isolating switch to isolate power supply to spring charging motor.
  - .1 Closing time of not more than 3 cycles.
- .4 Breakers with on-off indicator and spring charged/discharged indicator.
- .5 Interlocks to prevent circuit breaker drawout when in closed position and to prevent closing unless fully engaged or in test position.
- .6 Integral handles on each side of the breaker.
- .7 The primary contacts shall have an easily accessible wear indicator to indicate contact erosion.
- .8 The power circuit breaker shall have three windows in the front cover to clearly indicate any electrical accessories that are mounted in the breaker. The accessory shall have a label that will indicate its function and voltage.
- .9 The accessories shall be plug type and listed for easy field installation. They shall be modular in design and shall be common to all frame sizes and ratings.
- .10 The breaker control interface shall have color-coded visual indicators to indicate contact open or closed positions as well as mechanism charged and discharged positions. Manual control pushbuttons on the breaker face shall be provided for opening and closing the breaker.
- .11 The power circuit breaker shall have a "Positive On" feature. The breaker flag will read "Closed" if the contacts are welded and the breaker is attempted to be tripped or opened.
- .12 The current sensors shall have a back cover window that will permit viewing the sensor rating on the back of the breaker. A rating plug will offer indication of the rating on the front of the trip unit.
- .13 A position indicator shall be located on the faceplate of the breaker. This indicator shall provide color indication of the breaker position in the cell. These positions shall be Connect (Red), Test (Yellow), and Disconnect (Green). The levering door shall be interlocked so that when the breaker is in the closed position, the breaker levering-in door shall not open.
- .14 Each power circuit breaker shall offer front mounted dedicated secondary wiring points. Each wiring point shall have finger safe contacts, which will accommodate #10 AWG.

## 2.2 SEMICONDUCTOR TRIP UNITS

- .1 Solid-state tripping system consisting of three (3) current sensors, microprocessor-based trip device and flux-transfer shunt trip. Current sensors shall provide operation and signal function. The trip unit shall use microprocessor-based technology to provide the basic adjustable time/current protection functions. True rms sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors, and initiating trip signals to the circuit breaker trip actuators when

predetermined trip levels and time-delay settings are reached. Interchangeable current sensors with their associated rating plug shall establish the continuous trip rating of each circuit breaker

- .2 The trip unit shall have an information system that provides LEDs to indicate mode of trip following an automatic trip operation. The indication of the mode of trip shall be retained after an automatic trip. A reset button shall be provided to turn off the LED indication after an automatic trip.
- .3 The trip unit shall be provided with a display panel, including a representation of the time/current curve that will indicate the protection functions. The unit shall be continuously self-checking and provide a visual indication that the internal circuitry is being monitored and is fully operational.
- .4 Complete system selective coordination shall be provided by the addition of the following individually adjustable time/current curve shaping solid-state elements:
  - .1 All circuit breakers shall have adjustments for long delay pickup and time.
  - .2 Main circuit breakers shall have individual adjustments for short delay pickup and time, and include I<sub>2t</sub> settings.
  - .3 Main circuit breakers shall have an adjustable instantaneous pickup.
  - .4 Main circuit breakers shall have individually adjustable ground fault current pickup and time, and include I<sub>2t</sub> settings or ground alarm only.
- .5 The trip unit shall be provided with a making-current release circuit. The circuit shall be armed for approximately two cycles after breaker closing and shall operate for all peak fault levels above 11 times the ampere value of the rating plug.
- .6 The microprocessor-based trip unit shall have both powered and unpowered thermal memory to provide optimum circuit protection.
- .7 The trip unit shall have a LCD display showing phase, neutral, ground current, and overload.
- .8 The trip unit shall be equipped to permit communication via a network twisted pair to the LAN system provided in the equipment for remote monitoring and control.
- .9 Acceptable products:
  - .1 Digitrip unit of Eaton (Cutler-Hammer).
  - .2 Micrologic unit of Schneider Electric (Square D).
  - .3 Sensitrip unit of Siemens.
  - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

## **2.3 OTHER DEVICES AND ACCESSORIES**

- .1 Shunt trip.
- .2 Auxiliary switches: 8 N.O., 8 N.C.
- .3 Alarm switch.

- .4 Pilot light.
- .5 Control switch.
- .6 Remote close.
- .7 Lockout devices.
- .8 Padlocking provision.
- .9 Assembly fittings and mounting accessories.
- .10 Operation counter.
- .11 Trolley with a manual lifting device for transporting the breaker.

## **2.4 NAMEPLATES**

- .1 Engraved nameplates, fixed on front side, to be provided for each main and branch circuit and according to Section 26 05 00 - Common Work Results for Electrical.

## **2.5 FACTORY TESTS**

- .1 Provide a certified factory production test report.

## **2.6 ACCEPTABLE PRODUCTS**

- .1 Model Magnum DS of Eaton.
- .2 Model Masterpact of Schneider Electric.
- .3 Model 3WL of Siemens.
- .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air circuit breakers installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 INSTALLATION**

- .1 Install air circuit breakers as indicated.

**3.3            SETTINGS ON SITE**

- .1        Adjust trip unit settings according to coordination study.

**3.4            TRAINING**

- .1        Training to be provided by a qualified representative of the manufacturer. The training program should include guidelines on circuit breakers and main components.

**3.5            CLEANING**

- .1        Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1        Leave Work area clean at end of each day.
- .2        Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**