SECTION 262413

SWITCHBOARDS

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**NOTE TO SPECIFIER**

*Use this Specification Section for Mail Processing Facilities.*

***This is a Type 2 Specification with primarily editable text; therefore, most of the text can be edited, but there is some required text which is noted within the Section with a “Note to Specifier.” Do not revise these paragraphs without an approved Deviation from USPS Headquarters, Facilities Program Management, through the USPS Project Manager.***

*For Design/Build projects, do not delete the Notes to Specifier in this Section so that they may be available to Design/Build entity when preparing the Construction Documents.*

*For the Design/Build entity, this specification is intended as a guide for the Architect/Engineer preparing the Construction Documents.*

*The MPF specifications may also be used for Design/Bid/Build projects. In either case, it is the responsibility of the design professional to edit the Specifications Sections as appropriate for the project.*

*Text shown in brackets must be modified as needed for project specific requirements.* *See the “Using the USPS Guide Specifications” document in Folder C for more information.*

*The last date that USPS revised this standard specification section occurs in two places, at the end of this section and in the Table of Contents. If the date in this section matches the date in the Table of Contents, then you are using the latest version. Do not delete or revise the “last revised” date at the end of the section during the development of the Project Manual.*

*The footer in this section should be edited to replace the text, “USPS MPF SPECIFICATION” with the project name, and the blank date in the center should be replaced with the submission date, for interim design reviews, or the issue date of the completed Project Manual.*

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1. GENERAL
   1. SUMMARY
      1. The contractor shall provide and install [service entrance] [distribution] switchboards as herein specified and shown on related electrical drawings.
      2. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.
      3. Related Sections include the following:
         1. Section 019113 - General Commissioning Requirements.
         2. Section 251104 - Metering Devices.
         3. Section 260500 - Common Work Results for Electrical.
         4. Section 260800 - Commissioning of Electrical Systems.
         5. Section 261116 - Secondary Unit Substations.
         6. Section 261216 - Dry-Type, Medium-Voltage Transformers.
         7. Section 261414 - Infrared Viewing Panes (IR Windows).
         8. Section 337173 - Electrical Utility Service.
   2. SUBMITTALS
      1. Product Data: Submit manufacturer's printed product data.
      2. Drawings: Submit shop drawings for approval. Include components, materials, finishes, detailed plan and elevation views, required conduit rough-in openings, anchors and accessories.
   3. RELATED STANDARDS
      1. The switchboard shall be designed, manufactured, and tested according to the latest applicable version of the following standards:
         1. ANSI/NFPA 70 – National Electrical Code (NEC)
         2. NEMA PB2 – Deadfront Distribution Switchboards
         3. UL 891 – Deadfront Switchboards
   4. QUALITY ASSURANCE
      1. Manufacturer: For equipment required for the work of this section, provide product which is the responsibility of one manufacturer.
      2. Performance Requirements: Provide switchboards manufactured in accordance with Article 408 of the latest National Electrical Code and applicable portions of the NEMA PB2, UL 891 and NFPA 70, the National Electrical Code.
   5. DELIVERY, STORAGE, AND HANDLING
      1. Deliver materials and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures, and construction operations.
2. PRODUCTS
   1. MANUFACTURERS
      1. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
         1. Eaton Corporation, Cutler-Hammer Products, Pittsburg, PA (800) 525-2000.
         2. General Electric Company (800) 626-2000.
         3. Siemens Energy and Automation, Alpharetta, GA (800) 964-4114.
         4. Square D Company, Palatine, IL (800) 392-8781.
         5. No substitutions permitted.
      2. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.
      3. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum of 10 years.
   2. GENERAL REQUIREMENTS
      1. Construction
         1. Switchboard shall be of the modular type construction, constructed in accordance with the latest NEMA PB-2 and UL 891 standards, with the required number of vertical sections bolted together to form one metal enclosed rigid switchboard. The sides, top and rear shall be covered with removable screw-on code gauge steel plates. Switchboard shall include all protective devices and equipment as listed on drawings with necessary interconnections, instrumentation, and control wiring. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Service entrance switchboards shall be suitable only for use as service equipment and be labeled in accordance with UL requirements. System voltage, amperage and interrupting capacity shall be as indicated on the drawings. Enclosure construction shall be NEMA 1 indoor.
      2. Bus Requirements
         1. The bus shall be of sufficient size to limit the temperature rise to 65 degree C, based on UL tests. The bus shall be braced and supported to withstand mechanical forces exerted during a short circuit from a power source having the available short circuit current as indicated on the drawings. Provide a full capacity neutral where a neutral is indicated on the drawings. The through bus on the end section shall be extended and pre-drilled to allow the addition of future sections. Ground bus and grounding conductor lug shall be furnished. Ground bus shall extend the entire length of the switchboard and shall be firmly secured to each vertical section. Bus Material shall be silver-plated copper.
      3. Incoming Service
         1. [Underground Service: To isolate incoming underground service conductors, an underground cable pull or auxiliary section shall be used. This section shall be of the [non-bussed] [bussed] type and shall be sealable per local utility requirements, when required.]
         2. [Overhead Service:
            1. Cable entry: Where necessary, provide top cable pull box and provide construction that shall be sealable per local utility requirements, when required.
            2. Busway Entry: Switchboard to be fed by copper busway, as detailed on drawings [and other sections of this specification]. The switchboard manufacturer shall be responsible for coordination, proper phasing and internal bussing to the incoming busway.]
         3. Service Section: The service section shall be designed for the system parameters indicated and shall have user metering and main protective device as indicated.
         4. Screw-type mechanical lugs to terminate copper cable shall be provided as detailed on the drawings.
      4. [Fire Pump Tap
         1. The fire pump tap section shall be on the line side of the main disconnect(s) and contain only through bus and tap lugs to feed the fire pump.]
      5. Main Protective Device
         1. Service entrance style switchboards shall be double-ended type equipped with draw-out, low voltage, power circuit breakers for the “mains and tie” breakers and molded case feeder circuit breakers. Low voltage power circuit breakers shall be provided with a drawout frame and current rating as shown on the drawings. It shall be electrically operated power circuit breaker with a solid-state trip device providing adjustments for long time pick up and delay, short time pickup and delay, instantaneous, ground fault pickup and delay, and zone selective interlocking for short time and ground fault.
            1. Insulated case, draw-out circuit breakers shall comply with the requirements of UL489 and UL1066. Breakers shall be three-pole, 100% rated type:

Circuit breaker element shall have connected, test and disconnected position indicators, spring charged/discharged indicators and circuit breaker open or closed and ready to close indicators all of which shall be visible to the operator with the compartment door closed. It shall be possible to rack the circuit breaker element from the connected to the disconnected position with the compartment door closed, otherwise known as “through the door drawout”.

Provide interlocks to prevent racking the circuit breaker unless the breaker is open.

Ratings: Interrupting up to 100 kA at 480V without fuses. Short time current ratings for each circuit breaker shall be as indicated on the drawings or data tables. Circuit breakers shall be 600-volt class.

Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:

Normal Closing Speed: independent of both control and operator

Electrical operator, field installable with manual charging

Operations counter

Each low voltage circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of high accuracy (<1%) Rogowski coil sensors on each phase, a release mechanism and the following features:

Field Installable and interchangeable front mounted trip units. Trip units can be upgraded for future expansion in functionality, such as communication.

Functions: Long time, short time and extended instantaneous protection function shall be provided (EIP) to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall furthermore allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I2t ramp and optionally I4t to improve co-ordination with fuses or inverse relays.

A software program shall be made available free of charge to support system co-ordination studies. The software will allow time current curves to be generated for the chosen settings.

Individual LED’s shall indicate an overcurrent, short circuit or ground fault trip condition.

Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system ModBus.

Current Adjustability shall be accomplished by use of dial setting and rating plugs on trip units. The rating plug shall be front mounted and upgradeable. Upgrades to the rating plugs shall not require changes to the CT.

Pickup Points: 10 Long Time Settings.

Field Installable Ground-fault protection with at least three time-delay bands and an adjustable current pickup and an I2t ramp. Arrange to provide protection for three-wire service.

Field installable zone selective interlocking: Connections will be made between main, tie and feeder circuit breakers to ensure that the circuit breaker closest to the fault trips for short time and ground fault conditions.

A LCD display shall be available to simplify settings & viewing data locally.

Field installable configurable analog and digital output relays shall be available to connect directly to the trip unit.

Waveform capture and display shall be accomplished on the trip units LCD display.

A visible pin shall indicate wear. In addition to the visible pin indicator, estimated contact wear shall be calculated in the trip unit.

Terminal Block Connections shall be front mounted and utilize screw type terminals.

Padlocking Provisions shall be included to install at least three padlocks on each circuit breaker to prevent movement of the drawout mechanism.

Operating Handle shall be an integral part of the breaker. No external tools shall be required to rack the breaker.

Control Switch: One for each electrically operated circuit breaker.

Key Interlocks: Main and tie-breakers.

Undervoltage Trip: Adjustable time-delay.

Shunt-Trip – field installable.

Modular communication and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturer’s personnel to retrofit accessories.

Accessories shall be front mounted. Modular communications and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturer’s personnel to retrofit accessories.

Portable lifting yoke for drawout circuit breakers.

Field interchangeable accessories shall include CT’s, trip units, racking mechanism and all internal & external accessories.

* + - * 1. Feeder circuit breakers shall be molded case, quick-make, quick-break, trip-free, thermal magnetic, solid state type. The continuous current rating shall be adjustable from 20 to 100% without the need for a rating plug. Solid state breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous short time pickup and delay and ground fault pickup and delay, if required. Breaker ratings shall be as shown on the drawings.
      1. Main circuit breakers within switchboards downstream of the incoming service shall be molded case quick-make, quick-break, trip-free, thermal magnetic, solid state type. The continuous current rating shall be adjustable from 20 to 100% without the need for a rating plug. Solid state breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous short time pickup and delay, ground fault pickup and delay and zone selective interlocking for short time and ground fault. Breaker ratings shall be as shown on the drawings.
         1. Distribution section branch protective devices shall be molded case circuit breakers.

Molded Case Circuit Breakers (MCCB’s) shall be of quick-make, quick-break, trip-free, thermal magnetic, solid-state – 150 amp frame, 30 amp trip and above type with frame, trip and voltage ratings, as indicated on the drawings. The switchboard shall have space or fully equipped provisions for future units as shown on the drawings.

* + 1. Distribution Sections
       1. Individual sections shall be front accessible, not less than 20” deep and the rear of all sections shall align. Incoming line termination, main device connection and all bolts used to join current-carrying parts shall be installed so as to permit servicing from the front only so that no rear access is required. The branch devices shall be front removable and panel mounted with line and load side connections front accessible. The interior shall be capable of accepting panel mounted molded case circuit breakers.
    2. Ground Fault Protection
       1. Furnish and install, in the service equipment switchboard, ground fault protection and indication equipment as shown on drawings in accordance with NEC 230-95. All parts of the systems specified shall be UL Listed. All ground fault protection and indication equipment shall be factory installed, wired and tested by the switchboard manufacturer.
    3. Metering Equipment
       1. Advanced electric meters shall be provided as an integral part of building switchgear for new construction. Advanced electric meters shall be programmable and capable of measuring kWh and other power characteristics (kw, amperage, power factor, etc.) on 5 – 60 minute intervals with built-in data storage. A 15 minute interval measurement shall be programmed at installation. The data shall be accessible on a real-time basis and downloadable to the Building Automation System for management of data. Refer to section 337173 – Electrical Utility Services.
    4. Finish
       1. The complete switchboard shall be phosphatized and finished with ANSI 61 light gray polyester powder paint.
    5. Markings
       1. Each switchboard section shall have a label permanently affixed to it, listing the following information: Name of manufacturer, system voltage, ampacity, type, manufacturer's shop order number and date.
       2. Each section of switchboard shall bear a UL listing mark, where qualified and a short circuit rating label.
       3. Front, side, rear and top of each switchboard section will have a DANGER label in accordance with NEMA Standard PB-2.
    6. Transient-Voltage Suppression
       1. Provide Transient-Voltage Suppression per specification Section 264128.
    7. ARC FLASH
       1. Apply in the field, the factory supplied arc flash warning labels to all switchboards to warn qualified persons of potential electrical arc flash hazards.

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**NOTE TO SPECIFIER**

REQUIRED: All switchboards calculated to be classified as an ARC Flash Hazard Risk Category of “Dangerous” shall be equipped with IR Viewing Panes. Include paragraph 2.3 below for switchboards classified as HRC=Dangerous. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

* 1. INFRARED VIEWING PANES (IR WINDOWS)
     1. Each breaker position of the switchboard shall be equipped with an opaque, 3” round infrared window. The IR window shall be located on the [front] [rear] of the switchboard, centered on the cable to lug connections of the breaker. Refer to specification section 261414 for specific details.
     2. Acceptable installers:
        1. IR viewing panes shall be factory installed by the switchboard manufacturer or field installed by a certified installer, as recommended by the IR viewing pane manufacturer.
        2. Installer shall be factory certified and trained by the IR viewing pane manufacturer.

1. EXECUTION
   1. INSTALLATION
      1. Examine substrates and conditions in which units will be installed. Check for clearance that will be required before, during and after equipment installation. Do not proceed with installation until unsatisfactory conditions are corrected.
      2. Strictly comply with manufacturer's instructions and recommendations and NEMA PB 2.1. Coordinate installation with adjacent work to ensure proper sequence of construction, clearances, and support.
      3. Install units plumb, level and rigid without distortion to the switchboard cubicle(s).
   2. ADJUSTMENTS AND CLEANING
      1. Clean exposed surfaces using manufacturer recommended materials and methods.
      2. Touch-up damaged coatings and finishes using non-abrasive materials and methods recommended by manufacturer. Eliminate all visible evidence of repair.
   3. TESTING
      1. Perform factory and installation tests in accordance with applicable NEC, NEMA and UL requirements.
   4. WARRANTY
      1. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for [12 months] [18 months] from date of initial operation.

END OF SECTION

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