SECTION 16496A
AUTOMATIC TRANSFER SWITCHES – LOW VOLTAGE

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install the low voltage automatic transfer switches having the ratings, features/accessories and enclosures as specified herein and as shown on the contract drawings.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. The automatic transfer switches and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL and NEMA as follows:
   1. UL 1008 – Transfer Switches
   2. UL 991
   3. NFPA 70 – National Electrical Code
   4. NFPA 99 – Essential Electrical Systems of Health Care Facilities
   5. NFPA 110 – Emergency and Standby Power Systems
   6. NEMA ICS 10 – AC Transfer Switch Equipment
   7. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems
   8. IEC 801-2, 3, 4, and 5
   9. CISPR 11
   10. Compliant with FCC Part 15, Subpart B, Class A.

1.04 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:
   1. Master drawing index
   2. Front view and plan view of the assembly
   3. Schematic diagram
   4. Nameplate schedule
   5. Component list
   6. Conduit space locations within the assembly.
   7. Assembly ratings including:
      a. Short-circuit rating
      b. Voltage
      c. Continuous current rating.
   8. Major component ratings including:
      a. Voltage

b. Continuous current rating
c. Interrupting ratings

9. Cable terminal sizes
10. Product Data Sheets.

B. Where applicable, the following additional information shall be submitted to the Engineer:
1. Busway connection
2. Connection details between close-coupled assemblies
3. Composite front view and plan view of close-coupled assemblies
4. Key interlock schematic drawing and sequence of operations
5. Mimic bus.

1.05 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:
1. Final as-built drawings and information for items listed in section 1.04
2. Wiring diagrams
3. Certified production test reports
4. Installation information
5. Seismic certification.

B. The final (as-built) drawings shall include the same drawings as the construction drawings and shall incorporate all changes made during the manufacturing process.

1.06 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of major components and control modules installed within the assembly.

B. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

C. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of Uniform Building Code (UBC) for zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, UBC: a peak of 2.15g's (3.2–11 Hz), and a ZPA of 0.86g's applied at the base of the equipment. The tests shall fully envelop this response spectrum for all equipment natural frequencies up to at least 35 Hz.

-- ✉OR --

C. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of the California Building Code (CBC) through zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test

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response spectrum shall be based upon a 5% minimum damping factor, CBC: a peak of 2.15g's (3.2-11 Hz), and a ZPA of 0.86g's applied at the base of the equipment. The tests shall fully envelop this response spectrum for all equipment natural frequencies up to at least 35 Hz.

-- ✉OR --

C. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of the BOCA National Building Code, paragraph 1612.6. This shall include both vertical and lateral required response spectra as specified. Alternatively, the manufacturer's certification may be based on a detailed computer analysis of the entire assembly structure and its components. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment.
The test response spectra shall meet or exceed the required response spectra peak acceleration of 1.6g's (3.2–11 Hz), and a ZPA of 1.0g as specified in the BOCA National Building Code, for all equipment natural frequencies up to at least 35 Hz.

D. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.

1. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon approved shake table tests used to verify the seismic design of the equipment.
2. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
3. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.07 REGULATORY REQUIREMENTS

A. Provide a certificate of compliance with UL 1008 for the transfer switches furnished under this section.

1.08 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 FIELD MEASUREMENTS

1.10 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

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1.11 EXTRA PRODUCTS

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cutler-Hammer

B. ☞_____

C. ☞_____

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the engineer ten (10) days prior to bid date.

2.02 RATINGS

A. The transfer switch shall have equal withstand, closing and interrupting ratings of ☞_____ amperes.

B. The transfer switch shall be 100% equipment rated for continuous duty.

C. The voltage rating of the transfer switch shall be no less than the system voltage rating. The continuous current rating of the transfer switch shall be no less than the maximum continuous current requirements of the system.

D. The transfer switch shall be 100% equipment rated for continuous duty as shown on the drawings and shall conform to the applicable requirements of UL 1008 for emergency system total load.

E. The automatic transfer switches shall be fully rated to protect all types of loads, inductive and resistive, from loss of continuity of power, without derating, either open or enclosed.

F. ✍Transfer switches rated 800 amperes and above shall have a minimum 60-cycle withstand rating of 51 kA. The transfer switch shall be rated for application with upstream power circuit breakers and insulated case circuit breakers having short-time delay settings of up to 30 cycles. Contacts shall not weld when used with upstream overcurrent protective devices that do not incorporate instantaneous trip units.

2.03 CONSTRUCTION

A. The switching panel shall consist of completely enclosed contact assemblies and a separate control logic panel. Control power for all transfer operations shall be derived from the line side of the source to which the load is being transferred.

B. Each transfer switch shall be positively interlocked both mechanically and electrically to prevent simultaneous closing of both sources under either automatic or manual operation. Main contacts shall be mechanically locked in position in both normal and emergency

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positions. A neutral position shall not be possible under normal electrical operation unless a delayed transition accessory is required for switching highly inductive loads.

C. Transfer switches shall be capable of being operated manually under full rated load conditions. Manual operation shall be accomplished by a permanently attached manual operator, or by integrally mounted pushbuttons. Removable manual operating handles, and handles that may move in the event of an electrical operation during the manual operation, are not acceptable. Manual operators requiring source or load disconnection prior to manual operation are not acceptable.

D. On transfer switches requiring a fourth pole for switching the neutral, the neutral shall be fully rated with equal withstand, closing and interrupting ratings to the power poles. Switched neutral poles which are add-on or overlap, or that are not capable of breaking full rated load current are not acceptable.

E. The transfer switch shall have a multi-tap voltage selection plug for ease of voltage adjustment in the field.

F. ✍Where shown on the drawings, transfer switches applied as service entrance switches shall be provided with overcurrent trip units and a service entrance label. An external key-operated selector switch shall be provided to disconnect the power supplies. Indicators shall be provided to show the availability of each source as well as breakers in a tripped or disconnected position. Provide a neutral disconnect link for three-pole solid neutral switches, and a neutral-to-ground main bonding jumper for all switches to meet UL service entrance requirements. Ground fault protection shall be provided for all switches rated 1000 amperes or more applied on 480Y/277V AC systems in accordance with NEC Article 230-95.

2.04 MICROPROCESSOR LOGIC

A. The transfer switch shall be controlled by a Cutler-Hammer microprocessor-based controller. The controller shall be hardened against potential problems from transients and surges. Operation of the transfer switch and monitoring of both sources shall be managed by the controller.

> ***Note to Spec. Writer:***
> Microprocessor-Based Controller units are available in three (3) models.
> Insert microprocessor based controller units into paragraph B below from Section 16496D as follows:
> ATC 400 – (Paragraphs 2.02 A through H)
> ATC 600 – (Paragraphs 2.03 A through H)
> ATC 800 – (Paragraphs 2.04 A through I)

B. Microprocessor-Based Controller

2.05 ✍DRAWOUT DESIGN

A. Where indicated on the drawings, the transfer switches shall be provided with a drawout mechanism to allow easy access for preventive maintenance, testing or inspection. The drawout mechanism shall provide visual indicators as to the position of the switch/breaker during the drawout operation.

2.06 WIRING/TERMINATIONS

✍ Note to Spec. Writer – Optional

A. Terminal blocks shall conform to NEMA ICS 4. Terminal facilities shall be arranged for entrance of external conductors from the top or bottom of the enclosure. The main transfer switch terminals shall be suitable for the termination of conductors shown on the plans.

> ***Note to Spec. Writer:***
> If high withstand option is selected in Paragraph 2.02.F above include paragraphs 2.07 and 2.08 for power switching device and trip unit.

2.07 POWER SWITCHING DEVICE

A. Protective switching devices shall be ✉[drawout] [fixed] insulated case circuit breakers, Cutler-Hammer type SPB or approved equal. Frame ratings shall be 400, 800, 1200, 1600, 2000, 2500, 3000, 4000 or 5000 (fixed only) amperes. All breakers shall be UL listed for application in their intended enclosures for 100% of their continuous ampere rating. Breakers shall be electrically operated.

B. A selective override circuit shall be provided on breakers having short-time adjustments but without instantaneous adjustments that will allow selectively up to its rms symmetrical short-time rating. This selective override circuit shall allow the breaker to ride through a fully offset (asymmetrical) fault equal to its rms symmetrical short-time rating in a system having an X/R ratio of 6.6 with a maximum single-phase peak current of 2.3 times the rms symmetrical short-time ranging. No deviations from this specification shall be acceptable.

C. All breakers shall be provided with a true, two-step stored energy mechanism providing a maximum of five-cycle closing. All the energy required for closing the breakers shall be completely stored and held in readiness pending a release to close action. The insulated case breakers shall have high-endurance characteristics being capable of no-load and full-load interruptions at rated current equal to or exceeding the UL endurance ratings for molded case breakers without maintenance.

D. Insulated case breakers shall be provided with trip units as specified in paragraph 2.08 ✍____ through ✍____.

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Note to Spec. Writer:
Insert applicable trip unit spec. into paragraph 2.08 below from section 16904 as follows:

Digitrip RMS 510 – Basic protection and curve shaping (Paragraph 2.03 A through J)

Digitrip RMS 610 – Same as 510 plus local current display (Paragraph 2.03 A through N)

Digitrip RMS 810 – Same as 610 plus energy monitoring/display, and remote communications (Paragraph 2.03 A through R)

Digitrip RMS 910 – Same as 810 plus voltage, power factor and harmonic analysis and display (Paragraph 2.03 A through S)

Digitrip OPTIM 750 – Programmable curve shaping, load monitoring, and communications (Paragraph 2.04 A through O)

Digitrip OPTIM 1050 – Same as 750 plus power and energy monitoring; harmonic monitoring and analysis (Paragraph 2.04 A through R)

2.08 TRIP UNITS

2.09 CUSTOMER METERING

A. Where indicated on the drawings, provide a separate customer metering compartment with front hinged door and include the following:
   1. Current transformers where shown on the drawings or elsewhere specified shall be wired to shorting-type terminal blocks.
   2. ✉[Potential transformers including primary and secondary fuses with disconnecting means] [Fused potential taps as the potential source] for metering as shown on the drawings.

Note to Spec. Writer:
Select devices as required for item 2.09 B. Refer to section 16901 for detailed specification for metering as follows:
IQ Analyzer – 6000 Series (Section 16901, paragraph 2.02 A)
IQ DP-4000 Series (Section 16901, paragraph 2.02 B)
IQ 300 Series (Section 16901, paragraph 2.02 C)
IQ 200 Series (Section 16901, paragraph 2.02 D)

B. Microprocessor-Based Metering System

2.10 ENCLOSURE

A. Each transfer switch shall be provided in an enclosure suitable for use in environments indicated in the drawings. Enclosure options include NEMA 1, NEMA 12, NEMA 3R, NEMA 4, and NEMA 4X.

2.11 FINISH

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A. NEMA 1, 12 or 3R enclosures shall be painted with the manufacturer's standard light gray ANSI 61.paint. NEMA 4 or 4X shall be stainless steel, non-painted.

2.12 ✍COMMUNICATIONS

A. Where shown on the drawings, provide in the transfer switch a microprocessor-based unit capable of communicating phase and ground current, peak demand, present demand, energy consumption, contact status, and mode of transfer to the master control unit via a communications network. Communication network shall be Cutler-Hammer PowerNet system.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.
   1. Insulation check to ensure the integrity of insulation and continuity of the entire system
   2. Visual inspection to ensure that the switch matches the specification requirements and to verify that the fit and finish meet quality standards
   3. Mechanical tests to verify that the switch's power sections are free of mechanical hindrances
   4. Electrical tests to verify the complete electrical operation of the switch and to set up time delays and voltage sensing settings of the logic

B. The manufacturer shall provide three (3) certified copies of factory test reports.

3.03 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.04 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and start-up of the equipment specified under this section for a period of ☞____ working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

B. The contractor shall provide three (3) copies of the manufacturer's field start-up.

3.05 MANUFACTURER'S CERTIFICATION

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

✍ Note to Spec. Writer – Optional
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B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.06 TRAINING

A. The contractor shall provide a training session for up to five (5) owner's representatives for ☞____ normal workdays at a jobsite location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers and major components within the assembly.

3.07 INSTALLATION

A. The contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the contractor.

C. The equipment shall be installed and checked in accordance with the manufacturer's recommendations.

3.08 FIELD SERVICE ORGANIZATION

A. The manufacturer of the ATS shall also have a national service organization that is available throughout the contiguous United States and is available on call 24 hours a day, 365 days a year.

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