

SECTION 16231

AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install a bypass/isolation automatic transfer switch (ATS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. The bypass/isolation automatic transfer shall consist of an inherently double throw power transfer switch unit and a control module interconnected to provide complete automatic operation. The transfer switch and control module shall be the product of the same manufacture.

1.2 REFERENCES

- A. The automatic transfer switch and accessories shall conform to the requirements of:
 - 1. UL 1008 – Standard for Automatic Transfer Switches:
 - 2. UL 50 – Cabinets and Boxes
 - 3. UL 508 – Industrial Control Systems
 - 4. NFPA 70 – National Electrical Code
 - 5. NFPA 110 – Emergency and Standby Power Systems
 - 6. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
 - 7. NEMA ICS – Industrial Controls and Systems
 - 8. NEMA Standard ICS10-1993 (formerly ICS2-447) – AC Automatic Transfer Switches.

1.3 SUBMITTALS:

- A. Mark all proposed deviations from Specifications prominently in the submittals. Indicate compliance with the Specifications except for specifically identified exceptions. Submittals that do not clearly indicate compliance with the Specifications may be rejected. **Bills of Material that do not correspond with the Specifications are not sufficient to establish compliance.**
- B. Review of submittals is for general conformance to design concept and general compliance with Specifications. Review comments do not imply waiver of Specifications unless specifically noted.
 - 1. No installation will be accepted without Owner approved submittals
- C. Submittals for review/approval:
 - 1. Shop drawings and operating manuals.
 - 2. Schematic diagram

3. Component List
4. Conduit entry/exit locations
5. Assembly ratings including
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
6. Color sample for enclosure for approval when non-standard color is specified.
7. Mounting details and information for seismic calculations for anchorage of ATS.

D. Submittals for information:

1. When requested by the Engineer the following product information shall be submitted:
 - a. Descriptive bulletins
 - b. Product data sheets

1.4 SUBMITTALS – FOR CLOSEOUT

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in section 1.3
2. Wiring diagrams
3. Certified production test reports
4. Installation information
5. Seismic certification and equipment anchorage details
6. Instruction books and/or leaflets
7. Recommended renewal parts list

B. Submit five (5) copies of the above information

C. Section 01700 – Closeout and Turnover Procedures

1.5 QUALIFICATIONS

A. The manufacturer of the bypass/isolation automatic transfer switches shall be the manufacturer of the major components within the assembly.

B. The transfer switch assembly and circuit breakers shall be suitable for and certified to meet applicable seismic requirements of the California Building Code (UBC) for Critical Facilities, Importance Factor 1.5.

1.6 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.

1.7 SYSTEM DESCRIPTION

- A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single solenoid or motor operated mechanism, momentarily energized. The switch shall be mechanically interlocked to ensure only one of two possible positions: normal, or emergency.
- B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- C. All main contacts shall be silver composition. The switch shall have segmented, blow-on construction for high current capability and be protected by separate arcing contacts.
- D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.
- E. START-UP: On completion of the installation, start-up shall be performed by a factory-trained dealer service representative who shall demonstrate proper operation and instruct Owner's operating personnel in procedures. Time for instruction shall be designated by Project Manager.
- F. Provide Bypass/Isolation feature at all Automatic Transfer Switches for maintenance purposes.

PART 2 - PRODUCTS

2.1 MANUFACTURES

- A. ASCO
- B. No Substitutions

2.2 RATINGS

- A. The transfer switch shall withstand, closing and interrupting ratings of 65,000 amperes, minimum with standard circuit breaker protection
- B. The voltage 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.

- C. 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.
- D. The automatic transfer switches shall be fully rated for all types of loads, inductive and resistive, from loss of continuity of power, without de-rating, either open or enclosed.
- E. The isolation and bypass devices shall meet all rating requirements of the automatic transfer switch including full-load current, withstand, closing, interrupting, and mechanical endurance ratings.

2.3 CONSTRUCTION

- A. The transfer switches shall consist of completely enclosed contact assemblies and a separate control logic panel. The contact assemblies shall be operated by a non-fused motor operator or stored energy mechanism and be energized only momentarily during transfer, providing inherently double throw switching action. Control power for all transfer operations shall be derived from the line side of the source to which the load is being transferred.
- B. Transfer switches shall be capable of being operated manually under full load conditions. Manual operation shall be accomplished via a permanently affixed manual operator or integrally mounted pushbutton operators located on the face of the contact assemblies. Removable manual operating handles and handles which move in the event that electrical operators should suddenly become energized while performing a manual transfer operation are not acceptable. The manual operator shall provide the same contact-to-contact transfer time as provided under normal automatic operation to prevent possible flashovers from switching the main contacts slowly. In addition, provisions shall be made to allow disengagement of the electrical operator during manual operation.
- C. 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 positions. A neutral position shall not be possible under normal electrical operation unless a delayed transition accessory is provided for switching highly inductive loads. A transfer switch position indicator shall be visible from the front of the switch to show to which source the transfer switch is connected.
- D. All three-phase four-wire transfer switches used on systems with ground fault equipment shall be true four-pole switched neutral type with all four poles for each source being fully rated and connected to a common shaft. The fourth (neutral) pole contacts shall be of identical construction as, and operate simultaneously with, the main power contacts.

- E. Inspection and replacement of all separate arcing contacts (moving and stationary) shall be possible from the front of the transfer switch.
- F. An electronic sensing and control logic panel shall be separately mounted from the power switching portion of the transfer switch. The two sections shall be connected by control cables with plug-in connectors. The control section shall be capable of being disconnected from the power section for maintenance purposes.
- G. The logic circuit shall utilize electronic components mounted on printed circuit boards to accomplish functions such as timing, time delays, and voltage and frequency monitoring. A display shall be furnished to indicate the operation of each solid-state function. Modification shall be available for field installation without voiding the UL label.
- H. Bypass and isolation switches shall consist of completely enclosed contact assemblies with dead-front operation. Positive mechanical interlocks shall prevent simultaneous closing of the normal and emergency power sources when in the bypass and/or isolated mode. Bypass and isolation switches utilizing only electrical interlocking to prevent simultaneous closing of both power sources are not acceptable.
- I. Operating handles for the bypass and isolation switches shall be externally operable. Operating instructions shall be permanently affixed to the outside of the enclosure.
- J. The automatic transfer switch and the bypass and isolation switch section shall be connected together via copper bus.
- K. DRAWOUT DESIGNS
- L. Where indicated on the drawings, the transfer switch shall be provided with a drawout mechanism to allow easy access to the transfer switch for preventive maintenance, testing or inspection. The drawout mechanism shall provide visual indicators as to position of the switch/breaker during the drawout operation.

2.4 WIRING/TERMINATIONS

- 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.
- B. All control wire terminations shall be identified with tubular sleeve-type markers.

2.5 SEQUENCE OF OPERATION

- A. The transfer switch shall automatically transfer its load circuit to an emergency or alternate power supply upon failure of its normal or preferred source.
- B. Upon loss of phase-to-phase voltage of the normal source to 80% of nominal, and after a time delay, adjustable from 0.5 to 15 seconds, to override momentary dips and/or outages, a 10-ampere, 30-Vdc contact shall close to initiate starting of the emergency or standby source power plant. Transfer to the alternate source shall take place immediately upon attainment of 90% of rated voltage and frequency of that source.
- C. When the normal source has been restored to 90% of rated voltage, and after a time delay, adjustable from 0.5 to 32 minutes (to ensure the integrity of the normal power source), the load shall be retransferred to the normal source.
- D. A time delay, adjustable from 0.5 to 32 minutes, shall delay shutdown of the emergency or standby power source after retransfer to allow the generator to run unloaded for cool down, after which the generator shall be automatically shut down.
- E. If the emergency or standby power plant should fail while carrying the load, transfer to the normal power supply shall be made instantaneously upon restoration of the normal source to satisfactory conditions.
- F. Total isolation of all line and load connections of the automatic transfer switch shall be performed by the isolation mechanism. The isolation devices shall meet all rating requirements of the automatic transfer switch and bypass switches including full load current ratings, withstand, closing, and interrupting ratings, and mechanical endurance ratings.

2.6 ENCLOSURE

- A. Each transfer switch shall be provided in enclosures suitable for locations as indicated on the drawings and as described below:
 - 1. NEMA 1 surface or flush mounted general purpose enclosures primarily intended for indoor use.
 - 2. NEMA 12 dust-tight enclosures intended for indoor use primarily to provide protection against circulating dust, falling dirt, and dripping non-corrosive liquids.
 - 3. NEMA 3R raintight enclosures intended for outdoor use primarily to provide protection against rain, sleet, and damage from external ice formation.

4. NEMA 4 and NEMA 4X (stainless steel) watertight enclosures intended for indoor or outdoor use, primarily to provide protection against windblown dust and rain, splashing rain, hose-directed water, and damage from external ice formation.

2.7 FINISH

- A. NEMA 1, 12, or 3R enclosures shall be painted with manufacturer's standard painting procedures to ensure suitability for environment conditions as referenced in the plans. Color shall be light gray ANSI 61.

2.8 ACCESSORIES

- A. The logic of the transfer switch shall function via a microprocessor. Set points shall be field adjustable without the use of special tools. The display shall indicate:

1. Normal Source Available
2. Emergency Source Available
3. Normal Source Connected
4. Emergency Source Connected
5. Load Energized

- B. Include the following options:

1. Time delay transfer from the normal power source to the emergency power source (0 seconds to 30 minutes). **Set at 0.**
2. Provide a time to override a momentary power outage or voltage fluctuation (0 seconds to 120 seconds). **Set at 1 second.**
3. Provide a time delay transfer from the emergency power source to the normal power source (0 seconds to 30 minutes) **Set at 25 minutes**
4. Provide a time to allow the generator to run unloaded after retransfer to the normal power supply (1 second to 30 minutes). **Set at 5 minute.**
5. Provide three-phase under voltage and under frequency sensing on the normal power source. Voltage shall be factory set at 90% pickup and 80% dropout. Frequency sensing shall be set at 58-hertz pickup and 56-hertz dropout.

C. Provide a pilot light or visual indicator that:

1. The switch is in the normal position
2. The switch is in the emergency position.
3. The normal power is available
4. Emergency power is available

D. The following features shall be provided:

1. “In-phase monitor” that compares the phase angle difference between two energized sources and controls the transfer to minimize switching transients. In-phase monitor shall be provided on single operator double throw mechanisms only.
2. Two-position selector switch permitting “Test” (simulates normal power outage), and “Auto” (standard automatic operation). Do not provide an off position or any accessible control devices that disables the transfer switch.
3. A transfer switch position indicator shall be visible from the front of the switch.
4. Provide metering capability (Accessory 85L) as a safety feature to avoid entering the live switch for load measurements.
5. DO NOT provide a plant exerciser option or disable any integral exerciser function.

PART 3 – EXECUTION

3.1 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 NEMS standards.

1. Insulation check to ensure the integrity 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.

3.2 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS

- A. Only quality workmanship will be accepted. Haphazard or poor installation practice will be cause for rejection of work.
- B. Provide a foreman, to be in charge of this work, at all times.

3.3 COORDINATION

- A. Coordination work with other trades to avoid conflict and to provide correct rough in and connection for equipment furnished under trades that require electrical connections. Inform Contractors of other trades of the required access to and clearances around electrical equipment to maintain serviceability and code compliance.
- B. Verify equipment dimensions and requirements with provisions specified under this section. Check actual job conditions before fabricating work. Report necessary changes in time to prevent needless work.

3.4 MANUFACTURER'S INSTRUCTIONS

- A. Where the specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall at all times be kept in the job superintendent's office and shall be available to the Owner's Representative.
- B. Follow manufacturer's instructions where they cover points not specifically indicated on drawings and specifications, obtain clarification from the Architect/Owner before starting work via RFI.

3.5 QUALITY ASSURANCE

- A. Provide a meaningful Quality Assurance program. To assist the Contractor in this program, the specifications contained herein are set forth as the minimum acceptable requirements. This does not relieve the Contractor from executing other Quality assurance measures to obtain a complete operating facility within the scope of this project.
- B. The Contractor shall insure that all workmanship, all materials employed, all required equipment and the manner and method of installation conforms to accepted construction and engineering practices, and that each piece of equipment is in satisfactory working condition to satisfactorily perform its functional operation.

3.6 CUTTING AND PATCHING

- A. All cutting and patching required for work of this Division is included under other Divisions of this Specification. Coordination with General Contractor and other trades is imperative.

3.7 FIELD TEST AND OPERATIONAL CHECK

A. General Scope

1. The Contractor shall engage and pay for the services of an independent testing agency for the purpose of performing inspections and test as herein specified. The tests and inspections shall determine the suitability for energization. All tests shall be in strict accordance with NETA standards.
2. It is the intent of these tests to assure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications.
3. Schedule tests and give a minimum of 5 days advance notice to the Owner. The Owner reserves the right to witness any and all tests.
4. Equipment to be tested shall include:
 - a. Grounding System, Section 16060
5. Test Instrument Tractability
 - a. The testing laboratory shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.
 - b. The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain
 - c. Dated calibration labels shall be visible on all test equipment.

B. Final Settings:

1. The testing laboratory shall be responsible for implementing all final settings and adjustments on protective devices in accordance with Owner's specified values.

C. Test Reports:

1. The test report shall include the following:
 - a. Summary of project
 - b. Description of equipment tested.
 - c. Description of test

D. Failure to Meet Test:

1. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported directly to the Architect/Owner.
2. Contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory without additional cost to the Owner.

3.8 ACCEPTANCE DEMONSTRATION:

- A. Upon completion of the work, at a time to be designated by the Owner, the Contractor shall demonstrate for the Owner the operation of the electrical installation, including any and all special items installed by him or installed under his supervision.

END OF SECTION