

## **SECTION 26 36 23**

### **AUTOMATIC TRANSFER SWITCHES**

#### **PART 1 - GENERAL**

##### 1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

##### 1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide automatic transfer switch work as shown, scheduled, indicated, and as specified.

##### 1.3 STANDARDS:

- A. Equipment shall comply with the following standards:
1. UL 1008.
  2. NEC.
  3. NFPA 110 - Standard for Standby Power Systems.
  4. NFPA - Life Safety Code.
  5. ANSI/IEEE C37.90a - Surge Voltage Withstand.
  6. NEMA Standard ICS-109.21 - Impulse Withstand Voltage Test.

##### 1.4 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
1. Automatic Switch Company.
  2. Kohler.
  3. Onan.
  4. Russelectric, Inc.
  5. Zenith Controls, Inc.
- B. NEC and NFPA Compliance: Comply with applicable portions of the NEC (NFPA 70) including, but not limited to, emergency and standby power system.
- C. Standards: The automatic transfer switches shall conform to the requirements of NEMA Standard ICS 2-447 and Underwriters' Laboratories UL-1008 and shall be UL-listed as follows:
1. For use in emergency and stand-by systems in accordance with Articles 517, 700, 701 and 702 of the National Electric Code.
  2. Rated in amperes for total system transfer including control of motors, electric discharge lamps, electric heating, and tungsten filament lamp loads as referred to in Paragraph 1.7 and 1.9 of UL-1008.

- D. **Factory-Testing:** All production units shall be subjected to the following factory tests:
1. The complete automatic transfer switch shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
  2. Each switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.21.
  3. The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE Standard 472 (ANSI C37.90a) and the impulse withstand voltage test in accordance with the proposed NEMA Standard ICS 1-109.
- E. **Performance Tests:** Certified independent laboratory test data on a switch of the same design and rating shall be provided to confirm the following switching abilities:
1. Overload and endurance at 480 volts AC per Tables 25.1, 25.2, 27.1 and 27.2 of UL-1008 when enclosed according to NEMA Standard ICS 2-447 and UL 1008.
  2. Temperature rise tests after the overload and endurance tests to confirm the ability of the transfer switches to carry their rated current within the allowable temperature limits of the insulation in contact with current carrying parts.
  3. Withstand current tests per Paragraph 31 of UL-1008 for 200,000 amperes rms symmetrical when protected by fuses and at fault currents per UL-1008 when protected by circuit breakers, at 480 volts and X/R ratio of 6.6.
  4. No welding of contacts. Transfer switch must be operable to alternate source after the withstand current tests.
  5. Dielectric tests at 1960 volts, RMS, minimum after the withstand current test.
- F. **Warranty:** The automatic transfer switches shall be warranted for a period of 5 years from the date of Substantial Completion.

#### 1.5 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
1. Completely identified and marked catalog cuts of automatic transfer switches all associated equipment and devices, with all non-applicable items crossed out, and applicable equipment or devices clearly highlighted or identified.
  2. Interconnecting wiring diagrams to indicate all external interlock control wiring terminal connections.
  3. Complete bill of material for all equipment.
  4. Complete warranty information as specified.
  5. Additional information as required in Section 26 00 01.

#### 1.6 STORAGE AND HANDLING:

- A. Deliver automatic transfer switches in factory-fabricated water-resistant wrapping.
- B. Handle transfer switches carefully to avoid damage to material component, enclosure, and finish.

- C. Store transfer switches in a clean, dry space and protect from weather.
- D. Provide temporary heater so as to prevent moisture and condensation to internal equipment.

## **PART 2 - PRODUCTS**

### 2.1 AUTOMATIC TRANSFER SWITCHES:

#### A. General:

1. Provide automatic transfer switches with number of poles, voltage and full load current rating as shown or required. The neutral, where present shall **[not be switched. A solid neutral block shall be provided for termination of all neutral conductors.] [be switched using a four pole transfer switch with a full size neutral pole.]** Transfer switches shall be UL-listed per applicable UL standards as a recognized component for emergency systems and rated for all classes of loads. Sizes rated below 400 amperes shall also be rated for 100% tungsten lamp loads.
2. Automatic transfer switches shall be product of a quality manufacturer regularly engaged in the design, development and manufacture of solid-state electromagnetic switching devices with adequate testing facilities and a recognized quality control program to ensure product output reliability, performance and safety.
3. Automatic transfer switches (ATS) shall form a complete grounded, continuous-duty, integral assembly which is metal enclosed, dead front, and suitable for the voltage, amperage, load starting characteristics and environment where the switches shall be installed.
4. The manufacturer of the ATS units shall furnish switches complete and ready to operate with only the wiring connections to field devices left upon installation of the ATS.
5. Each ATS shall have been factory-tested for correct and proper operation as outlined in these Specifications.

#### B. Construction:

1. The transfer switch shall be electrically operated by a single non-fused solenoid or motor operator, momentarily energized from the source to which the load is to be transferred. The complete time of transfer, measured from the instant the operator is energized until the main contacts close on the alternate source, shall not exceed 1/3 of a second.
2. The transfer switch shall be mechanically locked in each direction without depending upon gravity, gear mechanisms, latches, or hooks. Release of the locking mechanism shall be possible only by normal operation of the electrical operator.
3. Main contact travel shall be smooth and continuous, with no momentary pause or delay, throughout the transfer operation. There shall be no possibility of a neutral position or for both sides to be closed simultaneously. An overload or short circuit shall not cause the switch to go to a neutral position.
4. Main contacts shall be silver alloy, wiping action type, protected by arc barriers with separate arcing contacts on all sizes. Blow-on construction, with rigid movable contacts and deflection by the stationary contacts, shall be furnished on all switches rated 400 amperes and higher. Electrical spacing shall not be less than those specified in Table 15.1 of UL Standard 1008.

5. Inspection and replacement of stationary and movable main contacts shall be possible from the front of the switch without major disassembly of associated parts, without disconnection of the power conductors or main operator linkages, and without removal of the switch from the enclosure.
  6. Main contacts consisting of assemblies or subassemblies, not originally manufactured for transfer switch service, shall be fully identified (name of the original manufacturer, catalog number and original electrical ratings). Any modifications made to the original products shall be described at the time of submittal.
  7. Each automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation.
  8. Switches shall be rated for continuous duty, shall be inherently double throw and shall be mechanically interlocked to ensure only one of two possible positions: (a) normal or (b) emergency.
  9. Automatic transfer switches shall be suitable for use with "emergency" sources such as an engine or turbine driven generator source or another utility source.
  10. The control module shall be supplied with a protective cover and be mounted separately from the transfer switch for ease of maintenance. The interconnecting wiring harness shall include a disconnect plug to disconnect all wires including both sources of control power for routine maintenance.
  11. Sensing and control logic shall be solid-state and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Interfacing relays shall be industrial control grade plug-in type with dust covers.
  12. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to stop the contacts at any point throughout the entire travel to properly inspect and service the contacts when required.
  13. Automatic transfer switches utilizing components of molded case circuit breakers, contactors, or parts thereof which have not been intended for continuous duty or repetitive load transfer switching are not acceptable.
- [VERIFY ENCLOSURE TYPE]**
14. The automatic transfer switches shall be mounted in NEMA [**1 non-ventilated**], [**12 dust-tight**] wall-mounted or floor-mounted enclosures. Switches and accessory devices shall have number of poles rated as shown on the plans.
  15. All metal surfaces, both inside and outside the cabinet, shall be primed and painted with ANSI 61, light gray, enamel-based paint.
  16. Doors shall be hinged and lockable.
  17. All components of the operating mechanisms and mechanical interlocks shall be insulated or grounded.

C. Operation:

1. The automatic transfer switch control panel shall utilize solid-state sensing on "normal" and "emergency" for automatic, positive operation. The following shall be provided:
  - a. Three phase automatic transfer switches - all phases of the "normal" source and of the "emergency" source shall be monitored line-to-line with close differential voltage sensing.

- b. The "pickup voltage" shall be adjustable from 85% to 100% of nominal.
  - c. The "dropout voltage" shall be adjustable from 75% to 98% of the pickup value.
  - d. The starting of the emergency source stand-by power system will be initiated upon "normal" source failure, or upon reduction of the "normal" source voltage to 80% of normal voltage.
  - e. Independent frequency sensing of the "emergency" source shall be provided.
  - f. The "pickup frequency" shall be adjustable from 90% to 100% of nominal.
  - g. The "transfer-to-emergency" will be initiated when the "emergency" source voltage is 90% or more of nominal voltage, and the frequency of the "emergency" source is 95% or more of nominal.
  - h. The "retransfer-to-normal" shall occur when "normal" source voltage restores to 90% of nominal voltage. Retransfer time delay to "normal" source shall be adjustable from zero to 30 minutes. Set time delay at 30 minutes. The time delay shall be automatically bypassed if the "standby" source fails. The ATS shall automatically retransfer to the "normal" source if the "standby" source fails and the normal source is available.
  - i. An in-phase monitor relay shall be provided and shall be wired and factory set such that hot source to hot source transfer in either direction is inhibited until the phase angle of both sources is within a 15 degree band. The in-phase monitor shall check for synchronization rather than simply being a time delay transfer.
  - j. Additional auxiliary contacts and interlocks as required for control functions listed in Paragraph 3.02.
2. Time Delay:
- a. A time delay to override momentary "normal" source outages to delay all transfer switch and engine starting signals. The time delay shall be field-adjustable from 0.5 to 6 seconds and factory-set for 4 seconds.
  - b. A time delay on "transfer-to-emergency" for the automatic transfer switch(es) shall be field adjustable from zero (0) to 60 seconds and shall be initially as follows:  
**[VERIFY]**  
**[ATS #1      0 seconds]**  
**[ATS #2      0 seconds]**  
**[ATS #3      30 seconds]**
  - c. Time delays on "transfer-to-emergency" and "retransfer-to-normal" for the Elevator automatic transfer switches shall be field adjustable from zero to 60 seconds and shall be initially set at 30 seconds. Refer to additional requirements for Elevator Automatic Transfer Switches hereinafter specified.
  - d. A time delay on "retransfer-to-normal" source shall be automatically bypassed if the "emergency" source fails and "normal" source is available. The time delay shall be field-adjustable from zero to 30 minutes and factory-set at 30 minutes.
  - e. A time delay for "shut-down" of the emergency generator set to provide unloaded running of the engine for cool-down. The time delay shall be field-adjustable from zero to 10 minutes and field-adjusted for the time setting as recommended by the stand-by generator set manufacturer.

- f. All time delays shall have an indicator to show the time delay setting including the units of measure used in the setting.
3. Engine Control Contacts: A contact that closes when "normal" source fails for initiating engine starting, rated 10 amps, 32 volts dc. Contacts to be gold plated for low voltage service.
4. Auxiliary Contacts:
  - a. **[Two] [Three]** auxiliary contacts that close when the automatic transfer switch is connected to "normal" source, rated 10 amps, 480 volts, 60 Hz ac. These contacts shall be in addition to those required for ATS indicators, monitoring and control interlock functions.
  - b. **[Two] [Three]** auxiliary contacts that close when the automatic transfer switch is connected to "emergency" source, rated 10 amps, 480 volts, 60 Hz ac. These contacts shall be in addition to those required for ATS indicators, monitoring and control interlock functions.
5. Manual Controls:
  - a. A test switch to momentarily simulate normal source failure. Refer to elevator automatic transfer switches for additional requirements.
6. Indicator Lights:
  - a. Two green indicator lights shall be provided, one to indicate normal source available and one to indicate load connected to normal source.
  - b. Two red indicator lights shall be provided, one to indicate emergency source available and one to indicate load connected to emergency source.

**[SELECT ONE OF THE FOLLOWING]**

7. **[Generator Exercise Timer:]**
  - a. **[A clock exerciser shall be furnished (in ATS-1) to automatically start the electric set at regular intervals and allow it to run for a preset time period, minimum of 30 minutes per week. A selector switch shall permit selection of "without load" or "with load" operation. "Without load" the electric set runs unloaded and "with load" the automatic transfer switch transfers the load to the electric set, after appropriate time delays, the same as it would for a normal source interruption.]**
  - b. **[Day and time shall be set as directed by the Owner. Time switch shall have battery backup or a spring wound reserve timer.]**

**[OR]**

8. **[Generator Paralleling Switchgear Interface:]**
  - a. **[Each ATS shall be interlocked with the Generator Paralleling Switchgear such that transfer to the "emergency" source is inhibited until there is adequate generator capacity on line to serve the ATS load. In addition, each ATS shall transfer to a dead "normal" source upon a signal from the Generator Paralleling Switchgear that load shedding is required due to an emergency generator failure.]**
  - b. **[The position of each ATS shall be annunciated with position indicating lights on the Master Control Section of the Generator Paralleling Switchgear.]**

**[VERIFY IF REQUIRED]**

9. **[Serial Communications Ports: Each transfer switch shall have an RS-422 serial communications port and interface board to allow remote annunciation and control of the transfer switch from the transfer switch remote annunciator or a future network supervisor. Serial Communications System will be equal to the Asco serial communications network.]**
10. **[Remote Transfer Switch Annunciator(s):]**

**[SELECT ONE OF THE FOLLOWING]**

a. **[Provide a microprocessor based remote transfer switch annunciator(s) shall be provided to provide remote status reporting and testing of each transfer switch. The annunciator shall be equal to the Asco No. 2140A400 annunciator and shall communicate with the transfer switches through a RS-422 serial communications network.]**

**[OR]**

b. **[Provide a lamp or LED type transfer switch annunciator with normal and emergency position indicator for each automatic transfer switch [and the fire pump automatic transfer switch] and a lamp test push button.]**

c. **[The annunciator(s) shall operate on 12 or 24 volts dc and shall be furnished with a 120 volt input power supply and backup battery power source located at the annunciator location.]**

D. Elevator Automatic Transfer Switches: Automatic transfer switches through which elevators are serviced shall function as follows:

1. The emergency power source shall be signaled to start by the transfer switch losing the "normal" power source. The automatic transfer switch controls shall send a separate, adjustable, 30 second nominal presignal to each elevator system served by the ATS. After the presignal delay, sufficient time for elevator back EMF to have dissipated, the automatic transfer switch shall "transfer-to-emergency" power source. Upon failure of the normal source, the pre-signal time delay to emergency shall be bypassed.
2. Provide auxiliary contacts that which close when the transfer switch is connected to the "emergency" source to signal individually each elevator group controller served by the ATS to initiate single elevator (one-at-a-time) operation.
3. Upon restoration of the "normal" power source, the automatic transfer switch controls shall send a 30 second presignal to each elevator system served by the ATS. The automatic transfer switch shall then "retransfer-to-normal" source, and all elevators in the group shall then become operational.
4. Testing system operation with both "normal" and "emergency" sources shall be provided by a test switch, and shall have 30 second presignal prior to transfer so that all cars stop at the nearest available floor.

E. Ratings:

1. Withstand Rating: RMS symmetrical fault current per Paragraph 31 of UL-1008 (dated April 13, 1989) for transfer switches protected by current-limiting fuses and circuit breakers.
2. Overload Rating: 50 operations, six times rated current, 0.40 to 0.50 power factor.

3. Endurance Rating: Ratings 1 to 1200 amperes; 6000 operations (0.40 to 0.50 power factor, 200% rated current).
4. Mechanical Durability: 100 operations, no-load, at a rate not less than one operation per second.
5. Interrupting Rating: 50 operations, any magnitude of current between 1% and 100% of rated current, 0.40 to 0.50 power factor.
6. Closing Rating: Inrush to 20 times rated current.
7. Thermal Rating: 20 times rated current, one second duration.
8. Temperature Rise: The manufacturer shall have performed tests on similar switches and the above ratings shall be based on using the same contacts for a series of tests without service or replacement of contacts. After testing, the maximum stabilized temperature rise of the main contacts carrying rated load in a non-ventilated enclosure shall not exceed NEMA standards (65°C rise).

F. Spare Parts and Tools:

1. Provide five spare indicating lamps for each ATS.
2. Provide one set of all tools required for normal maintenance at ATS.

**PART 3 - EXECUTION**

3.1 INSTALLATION OF AUTOMATIC TRANSFER SWITCHES:

- A. General: Automatic transfer switches shall be installed, including all connections, where and as indicated on Drawings and wiring diagrams as specified herein, and in accordance with approved Shop Drawings and manufacturer's instructions.
- B. Standards: Comply with the requirements of NEMA and NEC standards and applicable portions of NECA's, "Standard for Installation", for transfer switches.
- C. Tightness: Torque bus connections and tighten mechanical fasteners.
- D. Concrete Pad: Install floor-mounted transfer switches on a reinforced concrete pad. The ATS pad shall extend 3" beyond the switch enclosure, unless noted otherwise. Switch shall be bolted to the housekeeping pad using 3/8" minimum galvanized bolts and anchors on 30" maximum centers. Furnish the exact location of any blockouts, dimensions, and locations of the housekeeping pads in a timely manner so as to prevent delay of the concrete work. Refer to Section 26 25 01, "Electrical Basic Materials and Methods", for additional requirements.
- E. Adjustment: Adjust operating mechanisms for free mechanical movement.
- F. Finish: Touch-up scratched or marred surfaces to match original finish.

3.2 CONTROL WIRING:

**[VERIFY IF PARALLELING SWITCHGEAR IS REQUIRED.]**

- A. General: Provide control wiring from each automatic transfer switch **[and the fire pump transfer switch]** to the generator **[paralleling switchgear]** for generator starting **[and transfer switch control]**.
- B. Elevator Emergency Operation: Provide control wiring as required from automatic transfer switch emergency position indicating and presignal contacts to the emergency operation terminals on each elevator controller served by that transfer switch, for initiating the emergency operating sequence. Control wiring shall be installed in a suitable raceway.

**[EDIT TO SUIT PROJECT]**

- C. Load Disconnect: Provide load disconnect control wiring and relays as required from each automatic transfer switch load disconnect contact to disconnect control power to [ ] served by that automatic transfer switch, stopping all motors during transfer in either direction. Control wiring shall be installed in a suitable raceway.

**[EDIT TO SUIT PROJECT]**

- D. Annunciator Wiring: Provide wiring between transfer switches and to transfer switch annunciator located in the Fire Command Center. Communications wiring shall be installed in a suitable raceway.
- E. Auxiliary Contacts: One additional N.O. auxiliary contact which closes when ATS is connected to normal power and one additional N.O. auxiliary contact which closes when ATS is connected to standby power. These contacts are for future use and are in addition to any contacts required for control, interlock, or monitoring functions.

3.3 COORDINATION:

- A. Control Wiring: Coordinate control wiring connections and provisions with Division 14 for elevators. This coordination shall be the responsibility of this Division.
- B. Instructions and Drawings: Complete instructions, consisting of operating and maintenance manuals, parts book, dimensional drawings, separate unit wiring diagrams and schematics and interconnecting wiring diagrams shall be provided to the Engineer within 30 days of completion of the project.

3.4 TESTING:

- A. Pre-energization Checks: Prior to energization, check automatic transfer switches for continuity of circuits and for short circuits.
- B. General:
1. The complete installation shall be initially operated and checked out for operational compliance by representatives of the manufacturer of the automatic transfer switches.
  2. Upon completion of initial start-up and system checkout, the supplier of the automatic transfer switches or his authorized representative shall perform a field test, witnessed by the engineer, to demonstrate full compliance with all requirements of the specification, but not be limited to demonstration of proper operation of all control interlocks and a minimum of four automatic operations of each transfer switch. This testing shall be performed in conjunction with standby generator system testing.
- C. Reporting: Upon completion of the field test, four copies of the final report shall be documented, certified, and sent to the Engineer for distribution to the Owner or authorized Owner's representative, indicating that all automatic transfer switches in conjunction with the standby electric power system have been tested and are 100% operational.
- D. Thermographic Testing: Refer to Section 26 01 05, "Electrical Testing", for thermographic testing.

3.5 OPERATOR TRAINING:

A. The manufacturer's startup representative shall provide a minimum of **[8 hours]** of operating and maintenance training to the Owner's maintenance personnel. Training shall be provided at times convenient to the Owner. Approved Operating and Maintenance Manuals shall be available to the Owner prior to the training session.

3.6 IDENTIFICATION:

A. Refer to Section 26 05 53, "Identification of Electrical Systems" for applicable painting, nameplates, and testing.

**END OF SECTION 26 36 23**