

SECTION 26 36 23
AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the furnishing, complete installation, and connection of automatic transfer switches.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that is common to more than one section of Division 26.
- B. Section 26 05 71, ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY: Requirements for coordinated electrical system.
- C. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and Wiring.
- D. Section 26 32 13, ENGINE GENERATORS: Requirements for emergency power generation.
- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personal safety and to provide a low impedance path for possible ground fault currents.

1.3 QUALITY ASSURANCE

- A. Factory authorized representative shall maintain a service center capable of providing emergency maintenance and repair services at the project site within 4 hours maximum response time.
- B. Automatic transfer switch, bypass/isolation switch and annunciation control panels shall be products of same manufacturer.
- C. Comply with OSHA - 29 CFR 1910.7 for the qualifications of the testing agency.

1.4 SUBMITTALS

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings (including withstand), dimensions, weights, mounting details, conduit entry provisions front view, side view, equipment and device arrangement, elementary and interconnection wiring diagrams, and accessories.
 - 3. Complete nameplate data, including manufacturer's name and catalog number.

4. A copy of the markings that are to appear on the transfer switches when installed.

C. Manuals:

1. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating and maintenance manuals including technical data sheets, wiring diagrams and information, such as telephone number, fax number and web sites, for ordering replacement parts.
2. Two weeks prior to final inspection, submit four copies of a final updated maintenance and operating manual to the COTR.
 - a. Include complete "As installed" diagrams, which indicate all items of equipment and their interconnecting wiring.
 - b. Include complete diagrams of the internal wiring for each of the items of equipment, including "As installed" revisions of the diagrams.
 - c. The wiring diagrams shall identify the terminals to facilitate installation, maintenance, operation and testing.

D. Certifications:

1. Submit, simultaneously with the shop drawings, a certified test report from a recognized independent testing laboratory that a representative sample has passed UL 1008 (Prototype testing).
2. Additionally when transfer switches are used with power air circuit breakers having short-time trip elements without instantaneous trip elements provide a certified test report showing that the sample has passed the additional withstand requirements of this specification. Method of test shall be in accordance with UL 1008. Main contact separation as measured by an oscillograph voltage trace across the contacts will not be allowed during this test. Welding or burning of contacts is unacceptable.
3. Two weeks prior to final inspection, submit four copies of the following to the COTR:
 - a. Certification that no design changes have been made to the switch or its components since last certified by UL or as tested by an independent laboratory.
 - b. Certification by the manufacturer that the equipment conforms to the requirements of the drawings and specifications.
 - c. Certification by the Contractor that the equipment has been properly installed, adjusted, and tested.
 - d. A certified test report from an independent laboratory that a representative sample has passed the ANSI surges withstand test for transfer switches which incorporate solid-state components.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only:
- B. Institute of Electrical and Electronic Engineers (IEEE):
- 446-95.....Recommended Practice for Design and Maintenance of Emergency and Standby Power Systems
 - C37.90.1-02.....IEEE Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
- C. National Electrical Manufacturers Association (NEMA):
- 250-03.....Enclosure for Electrical Equipment (1000 Volts Maximum).
 - ICS 6-01.....Industrial Control and Systems Enclosures
 - IC3 4.....Industrial Control and Systems: Terminal Blocks
 - MG 1-03.....Motors and Generators, Revision 1
- D. National Fire Protection Association (NFPA):
- 70-05.....National Electrical Code (NEC)
 - 99-05.....Health Care Facilities
 - 110.....Emergency and Standby Power Systems
- E. Underwriters Laboratories, Inc. (UL):
- 50-03.....Enclosures for Electrical Equipment
 - 508-02.....Industrial Control Equipment
 - 891-03.....Dead-Front Switchboards
 - 1008-03.....Transfer Switch Equipment

PART 2 - PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCHES

- A. General:
1. Comply with UL, NEMA, NEC, ANSI and NFPA.
 2. Automatic transfer switches are to be electrically operated, mechanically held open contact type, without integral overcurrent protection. Transfer switches utilizing automatic or non-automatic molded case circuit breakers as switching mechanisms are not acceptable.
 3. The unit shall be completely factory-assembled and wired so that only external circuit connections are required in the field. The unit shall include, but not be limited to, operating mechanism, main contacts, auxiliary contacts, timers, pilot lights, switches, and auxiliary sensing devices.
 4. Each transfer switch shall be equipped with bypass/ isolation switch. The switch shall be part of the transfer switch.
- B. Ratings, Markings and Tests:

1. Ratings:
 - a. Phase, voltage, ampere rating, number of poles, withstand rating shall be as shown on the drawings. The ampere rating shall be for 100 percent continuous load current.
 - b. Transfer switches are to be rated for total system transfer on emergency systems.
 - c. Ratings shall be with non-welding of contacts during the performance of withstand and closing tests.
 - d. Maximum automatic transfer switch rating: 800 amperes
2. Markings:
 - a. Markings shall be in accordance with UL 1008.
 - b. Markings for the additional withstand test hereinafter specified shall be included in the nameplate data.
3. Tests:
 - a. Transfer switches shall be tested in accordance with UL 1008. The contacts of the transfer switch shall not weld during the performance of withstand and closing tests when used with the upstream overcurrent device.
 - b. Where used with molded case circuit breakers or power air circuit breakers with long-time and instantaneous trip, transfer switch withstand and closing rating shall equal or exceed the available short circuit current shown on the drawings, but shall not be less than the following:

Switch Rating (Amperes)	Withstanding Amperes (RMS Symmetrical)	Circuit Power Factor
Up to 100	25,000	Per UL
101 to 260	35,000	Per UL
261 to 400	42,000	Per UL
410 to 600	50,000	Per UL
601 to 1200	65,000	Per UL
1201 to 4000	85,000	Per UL

4. Additional Withstand Test:
 - a. See paragraph 1.4.D.1 for certification of "Withstand Test."
 - b. Where used with power air circuit breakers with long-time and short-time trips without instantaneous trip, transfer switch

withstand rating shall be based on the available short circuit current (RMS symmetrical) for a duration of ten cycles.

5. Surge Withstand Test:

- a. Transfer switches utilizing solid-state devices in sensing, relaying, operating, or communication equipment or circuits shall comply with ANSI C37.90.1.

C. Housing:

1. Enclose transfer switches in steel cabinets in accordance with UL 508, or in a switchboard assembly in accordance with UL 891, as shown on the drawings. NEMA ICS 6 Type as indicated on the drawings.
2. Doors: Shall have three-point latching mechanism.
3. Padlocking Provisions: Provide chain for attaching a padlock. Attach chain to the cabinet by welding or riveting.
4. Finish: Cabinets shall be given a phosphate treatment, painted with rust inhibiting primer, and finish painted with the manufacturer's standard enamel or lacquer finish.

2.2 FEATURES

A. Transfer switches shall include the following features:

1. Operating Mechanism:

- a. Actuated by an electrical operator.
- b. Electrically and mechanically interlocked so that the main contact cannot be closed simultaneously in both normal and emergency position, except for switches indicated as "closed transition" on the drawings.
- c. Normal and emergency main contacts shall be mechanically locked in position by the operating linkage upon completion of transfer. Release of the locking mechanism shall be possible only by normal operating action.
- d. Shall not include a neutral position.
- e. Contact transfer time shall not exceed six cycles.
- f. Do not use as a current carrying part. Components and mechanical interlocks shall be insulated or grounded.

2. Contacts:

- a. For switches 400 amperes and larger, protect main contacts by separate arcing contacts and magnetic blowouts for each pole. Arc quenching provisions equivalent to magnetic blowouts will be considered acceptable.
- b. Current carrying capacity of arcing contacts shall not be used in the determination of the transfer switch rating, and shall be separate from the main contacts.

- c. Main and arcing contacts shall be visible for inspection with cabinet door open and barrier covers removed.
- 3. Manual Operator:
 - a. Capable of operation in either direction under no load.
 - b. Capable of operation by one person.
 - c. Provide a warning sign to caution against operation when energized.
- 4. Replaceable Parts:
 - a. Include the main and arcing contact individually or as units, relays, and control devices.
 - b. Switch contacts and accessories are to be replaceable from the front without removing the switch from the cabinet and without removing main conductors.
- 5. Sensing Relays:
 - a. Provide voltage-sensing relays in each phase of the normal power supply.
 - b. Provide adjustable voltage and frequency sensing relays in one phase of the auxiliary power supply.
- 6. Controls:
 - a. Control module shall provide indication of switch status - emergency, normal, and be equipped with alarm diagnostic circuitry.
 - b. Control module shall control operation of the transfer switch. The sensing and the logic shall be controlled by a microprocessor equipped with digital communication and battery backup. The control shall comply with IEEE 472.

2.3 ACCESSORIES

- A. Transfer switches shall include the following accessories:
 - 1. Indicating Lights of different colors:
 - a. Green Signal light for normal source position.
 - b. Red Signal light for emergency source position.
 - 2. Laminated black phenolic nameplates with white letters to indicate transfer switch position.
- B. Manual Test Switch for simulating normal source failure.
- C. Engine starting contacts.
- D. Time delay relay to accomplish the function as specified.
- E. Auxiliary Contacts:
 - 1. Provide contacts for connection to elevator controllers, one closed when transfer switch is connected to normal, and one closed when transfer switch is connected to emergency.

2. Provide additional contacts as necessary to accomplish the functions shown on the drawings, specified, and designated in other sections of these specifications and one spare normally open and normally closed contact.
3. Contacts shall have a minimum rating of ten amperes and be positive acting on pickup and dropout.

F. Remote Indicators:

1. Provide remote pilot lamps to show transfer switch position.
2. Provide remote manual test switch to simulate normal source failure.
3. Provide remote contact to bypass retransfer time delay to normal source.

G. In-Phase Band Monitor: Monitor shall control the operation of the transfer switch. It shall monitor the voltage and frequency of the normal and emergency voltage. Provide for all equipment system transfer switches.

H. Auxiliary Relay: Provide an auxiliary pre-signal relay on all automatic transfer switches which will feed elevator loads for use as elevator control.

I. Closed Transition: Where indicated on the drawings, provide automatic transfer switch with make-before-break operation in both transfer directions, causing no interruption of power to the load when both the utility and emergency sources are energized and acceptable.

1. The two sources shall not be connected in parallel for longer than six cycles under normal operation.
2. If either source is not energized, or otherwise not acceptable for connecting the load (eg. Phase loss, undervoltage, overvoltage, underfrequency), the automatic transfer switch shall perform an "open transition" (break-before-make) transition between the sources.
3. Transfer switch shall monitor the state of both source contacts. If the set of contacts initially closed before the transfer sequence fail to open, the transfer switch shall immediately open the contacts that closed after initiation of the transfer sequence. If the switch is unable to open either set of contacts within six cycles, then the transfer switch shall close a set of dry contacts to signal a failure and cause the normal source breaker to trip. Switch shall be connected to 24V DC generator battery power to operate shunt trip mechanism in normal source breaker. A 24V DC shunt trip feature shall be provided for all normal source breakers feeding closed transition transfer switches.

J. Four-pole switch neutral: provide overlapping neutral transfer on 4-pole transfer switches.

- K. Loss of normal source: provide auxiliary contacts that close only when normal source is not accepted, regardless of the transfer switch position. This set of contacts shall shunt trip cam lock connections for load bank testing of generator, automatically disconnecting load bank upon a normal source failure.

2.4 TRANSFER SWITCH OPERATION

- A. Engine Start: A voltage decrease, at any transfer switch, in one or more phases of the normal power source to less than 70 percent of normal shall start the engine-generator unit after a time delay of two to three seconds. The time delay shall be field adjustable from zero to fifteen seconds.
- B. Transfer to Emergency (Emergency System Loads): Transfer switches for emergency system loads shall transfer their loads from normal to emergency source when frequency and voltage of the engine-generator unit have attained 90 percent of rated value. Only those switches with deficient normal source voltage shall transfer.
- C. Transfer to Emergency (Equipment System Loads): Transfer switches for equipment system loads shall transfer their loads to the generator on a time delayed staggered basis, after the emergency system switches have transferred. Total delayed transfer time of an equipment system switches shall not exceed two minutes. Time-delay relays shall be field adjustable zero to two minutes.
- D. Retransfer to Normal (All Loads): Transfer switch shall retransfer the load from emergency to normal source upon restoration of normal supply in all phases to 90 percent or more of normal voltage, and after a time delay. The time delay shall be field adjustable from five to twenty-five minutes (preset for twenty-five minutes) plus an additional delay for staggering retransfer. Should the emergency source fail during this time, the transfer switch shall immediately transfer to the normal source whenever it becomes available. After restoring to normal source, the generator shall continue to run for five minutes unloaded before shut down. Time delay shall be adjustable from zero to fifteen minutes.
- E. Exercise Mode: Transfer to emergency power source shall be accomplished by remote manual test switches on a selective basis.
- F. Specific switch delays: transfer switches shall have intentional delays for allowing a staggered transfer to the emergency and normal source to prevent large step loads on each source. Emergency system (critical and life safety branch) switches shall not have any delay transferring from a failed source. The table below indicates the delays for each specific switch after the source has been accepted:

Switch ID (ATS-)	Transfer to emergency delay (s)	Transfer to normal delay (s)(both sources available)*	Transfer to normal delay (s)(emergency source failure)
4C	0	RTD+10	0
4L	0	RTD+15	0
4Q	50	RTD+0	10
5C	0	RTD+40	0
5L	0	RTD+45	0
5Q	20	RTD+15	10
6C	0	RTD+35	0
6L	0	RTD+45	0
6Q	30	RTD+5	15
107L	0	RTD+30	0
107Q	40	RTD+0	20
		*RTD=1500 s (25 min.) See part D above	

2.5 BYPASS/ISOLATION SWITCHES (BP/IS)

- A. Provide two-way bypass/isolation manual type switches. The BP/IS shall permit load by-pass to either normal or emergency power source and complete isolation of the transfer switch, independent of transfer switch position. The switches shall conveniently and electrically bypass and isolate automatic transfer switches, which could not otherwise be safely maintained without disruption of critical loads. Bypass and isolation shall be possible under all conditions including where the automatic transfer switch may be removed from service. Bypass/Isolation switches shall comply with NFPA 110, and shall be factory tested.
- B. Operation: The bypass/isolation switch shall have provisions for operation by one person through the movement of a maximum of two handles at a common dead front panel in no more than 15 seconds or less. Provide a lock, which must energize to unlock the bypass switch, to prevent bypassing to a dead source. Provide means to prevent simultaneous connection between normal and emergency sources.

1. Bypass to normal (or emergency): Operation of bypass handle shall allow direct connection of the load to the normal (or emergency) source, without load interruption.
 - a. Assure continuity of auxiliary circuits necessary for proper operation of the system.
 - b. A red indicating lamp shall light when the automatic transfer switch is bypassed.
 - c. Bypassing source to source: If the power source is lost while in the bypass position, bypass to the alternate source shall be achievable without re-energization of the automatic transfer switch service and load connections.
 2. Isolation: Operation of the isolating handle shall isolate all live power conductors to the automatic transfer switch without interruption of the load.
 - a. Interlocking: Provide interlocking as part of the bypass/isolation switch to eliminate personnel-controlled sequence of operation, and to prevent operation to the isolation position until the bypass function has been completed.
 - b. Padlocking: Include provisions to padlock the isolating handle in the isolated position.
 - c. Visual verification: The isolation blades shall be visible in the isolated position.
 3. Testing: It shall be possible to test (normal electrical operation) the automatic transfer switch and engine generator with the isolation contacts closed, and the load bypassed without interruption of power to the load.
- C. Ratings: The electrical capabilities and ratings of the bypass/isolation switch shall be compatible with those of the associated automatic transfer switch, including any required additional withstand tests.
- D. Enclosure Construction: Enclosure construction shall be in accordance with UL standards. The bypass/isolation switch shall be mounted in a separate enclosure or separate compartment from the automatic transfer switch. NEMA ICS 6 enclosure rating shall match automatic transfer switch.
- E. Diagrams: The manufacturer shall provide specific information on the interconnection and installation of the bypass/isolation switch and automatic transfer switch.
- F. The bypass/isolation switch shall also meet all the requirements as specified for an automatic transfer switch.

2.6. SPARE PARTS

- A. Provide six control fuses for each automatic transfer switch of different rating.
- B. Provide six pilot lamps of each type used.

2.6. MANUFACTURER

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - 1. Automatic Switch Co.
 - 2. Russelectric, Inc.
 - 3. Zenith Controls, Inc.
 - 4. An alternate manufacturer approved by the COTR.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install automatic transfer switch(s) in accordance with the NFPA and as shown on the drawings.
- B. Level and anchor the automatic transfer(s) switch to floor or wall.
- C. Ground equipment as shown on the drawings and as required by NFPA 70.

3.2 WIRING TO REMOTE COMPONENTS

- A. Match type and number of cables and conductors to control and communications requirements of transfer switches as recommended by the manufacturer. Conductors shall be in accordance with Section 26 05 21 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). All conductors shall be in raceways in accordance with Section 26 05 33 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS. Contractor shall provide raceways adequately sized to accommodate all required control wiring. Provide all necessary conductors for a fully functional installation.
- B. Provide control conductors for engine start in conduit for all transfer switches.
- C. Provide conductors as required to interface transfer switches serving elevator loads with the elevator controller as specified herein before in Paragraph 2.3 Accessories.
- D. Provide conductors as required to interface closed transition switches to shunt trip operator of normal source breaker and shunt trip power source. Provide short circuit protection in circuit serving shunt trip.

3.3 START UP AND TESTING

- A. After the complete system has been installed, and before energizing the system, check all components of the system, including insulation resistance, phase to phase and phase to ground, complete electrical circuitry and safety features according to the manufacturer's written instructions

- B. After energizing circuits, test the interlocking sequence and operation of the complete system, including time delays of transfer from normal source to emergency and back to normal source, pick-up and voltage drop, and function of bypass/isolation switch in the presence of the Resident Engineer prior to the final inspection.
- C. When any defects are detected, correct the defects and repeat the test as requested by the Resident Engineer, at no additional cost to the Government.

3.4 DEMONSTRATION

At the final inspection in the presence of a VA representative, demonstrate that the complete auxiliary electrical power system operates properly in every respect. Coordinate this demonstration with the demonstration of the engine-generator set.

3.5 TRAINING

Furnish the services of a competent, factory-trained engineer or technician for one four-hour period for instructing VA personnel in operation and maintenance of the equipment, including review of the operation and maintenance manual, on a date requested by the Resident Engineer. Coordinate this training with that of the generator training.

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