

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 and bypass isolation 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 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and Wiring.
- C. 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 four hour 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):
 - 70-08.....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

1.6 EXTENDED WARRANTY

SEE CONTRACT DOCUMENTS FOR SPECIFICS.

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. 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	22,000	Per UL
101 to 260	35,000	Per UL
261 to 400	35,000	Per UL
410 to 600	35,000	Per UL
601 to 800	50,000	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. Acceptable Manufacturers:

1. ASCO 7000 Series or similar.

B. Transfer switches shall include the following features:

1. Operating Mechanism:

- a. Actuated by an electrical operator.
- b. Transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single solenoid mechanism. Electrically and mechanically interlocked so that the main contact cannot be closed simultaneously in both normal and emergency position.
- 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.
- g. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

2. Contacts:

- a. For switches 800 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. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 600 amps and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
 - d. The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
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.
 - d. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commality of parts.
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.

1. The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.
2. A single controller shall provide twelve selectable nominal voltages for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to $\pm 1\%$ of nominal voltage. Frequency sensing shall be accurate to $\pm 0.2\%$. The panel shall be capable of operating over a temperature range of -20 to +60 degrees C and storage from -55 to +85 degrees C.
3. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Sensing and control logic shall be provided on multi-layer printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The protective cover shall include a built-in pocket for storage of the operator's manuals.
4. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.
5. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

EN 55011:1991	Emission standard - Group 1, Class A
EN 50082-2:1995	Generic immunity standard, from which:
EN 61000-4-2:1995	Electrostatic discharge (ESD) immunity
ENV 50140:1993	Radiated Electro-Magnetic field immunity
EN 61000-4-4:1995	Electrical fast transient (EFT) immunity
EN 61000-4-5:1995	Surge transient immunity
EN 61000-4-6:1996	Conducted Radio-Frequency field immunity

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. A three position momentary-type test switch shall be provided for the test / automatic / reset modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal.
 - C. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
 - D. Time delay relay to accomplish the function as specified.
 1. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 24 VDC power supply.
 2. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
 3. Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
 4. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
 5. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minute time delay in any of the following modes:
 - a. Prior to transfer only.
 - b. Prior to and after transfer.
 - c. Normal to emergency only.
 - d. Emergency to normal only.
 - e. Normal to emergency and emergency to normal.
 - f. All transfer conditions or only when both sources are available.

6. All time delays shall be adjustable in 1 second increments, except the extended parallel time, which shall be adjustable in .01 second increments.
7. All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port.

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. Indicators:

1. LED indicating lights (16 mm industrial grade, type 12) shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
2. LED indicating lights (16 mm industrial grade, type 12) shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.

G. 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.

H. 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.

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

J. Communications Module: A full duplex RS485 interface shall be installed in the ATS controller to enable serial communications. The serial communications shall be capable to a direct connect or multi-drop

configured new communication network. This module shall allow for the seamless integration of existing or new communication transfer devices. The serial and Ethernet communication shall be ASCO accessory 72E.

- K. Power Manager: Furnish power managers at both the automatic switch and the bypass switch. The power manager shall be equal to ASCO accessory 85S.
1. The power manager shall be capable of interfacing with the Ethernet communications module to permit information to be sent to a central location for display, analysis and logging.
 2. The power manager shall accept inputs from industry standard instrument transformers.
 3. The power manager shall be equipped with an optional continuous duty, long life 4 line X 20 character LCD backlit display to provide local access to the following metered options.
 - a. Current, per phase RMS and neutral (if applicable)
 - b. Current Unbalance %
 - c. Voltage, phase-to-phase and phase-to-neutral
 - d. Voltage Unbalance %
 - e. Real power, per phase and 3-phase total
 - f. Apparent power, per phase and 3-phase total
 - g. Reactive power, per phase and 3-phase total
 - h. Power factor, 3-phase total & per phase
 - i. Frequency
 - j. Accumulated Energy, (MWH, MVAH, and MVARH
- L. Lock Out Relay with Manual Reset: Furnish lock out relay with manual reset at existing closed transition ATS. Provide ASCO accessory 86A.
- M. Selective Load Disconnect Circuit: Furnish selective load disconnect circuits to provide a pre-transfer and/or post transfer signal when transferring from emergency to normal and/or normal to emergency. Provide ASCO accessory 31Z.
- N. Load Disconnect Circuit with Sequential Load Reconnection: Furnish load disconnect circuit with sequential load reconnection. A pre-transfer signal is provided by the control panel when transferring from normal to emergency and or emergency to normal. Upon receipt of this signal the sequential controller and the TR relays located on the accessory panel are de-energized. The contacts of the TR relays return to the de-energized state providing signals to the remote load controllers supplied by customer to disconnect their loads. See ATS schedule for additional information. Provide ASCO accessory 31CJ.
- O. Remote Control Unit Cabinets (RCU).

1. Each RCU will shall be used to house the following control devices associated with the communication SCADA system.
 - a. Local best battery selector and associated control power alarm lights
 - b. Fused DC distribution to transmit the control power to the associated switchgear.
 - c. Ethernet switch with 8 Ethernet ports and 2 fiber ports as manufactured by *Advantech model number EKI - 7629C/CI*
 - d. Factory-wired terminal strips which consolidate the interface between the switchgear controls and the ATS controllers so that only a single set of field control wires are required to be run from the associated local switchgear and RTU terminal strip.
 - e. Factory-wired terminal strips to provide a connection to all points associated with the power quality meters to allow connection to the Owner's electrical power monitoring system.
 - f. Future rack space to support communication equipment as needed.
2. The enclosure shall be a 24" wide line-up and match switchgear selection to match all construction features of the controlled switchgear.
3. Each RCU shall be configured for both top and bottom entry of control conduits and conductors.

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.
- 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). 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. Controller Display and Keypad

1. A four-line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller.

- a. Nominal line voltage and frequency.
- b. Single or three phase sensing.
- c. Operating parameter protection.
- d. Transfer operating mode configuration.

2. All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

G. Voltage, Frequency and Phase Rotation Sensing

1. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout and trip setting capabilities (values shown as % of nominal unless otherwise specified):

<u>Parameter</u>	<u>Sources</u>	<u>Dropout / Trip</u>	<u>Pickup / Reset</u>
Undervoltage	N&E, 3 ϕ	70 to 98%	85 to 100%
Overvoltage	N&E, 3 ϕ	102 to 115%	2% below trip
Underfrequency	N&E	85 to 98%	90 to 100%
Overfrequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

2. Repetitive accuracy of all settings shall be within $\pm 0.5\%$ over an operating temperature range of -20°C to 60°C .

3. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial and Ethernet communications port access.
4. The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).
5. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases, frequency, and phase rotation.
6. The controller shall include a user selectable algorithm to prevent repeated transfer cycling to a source on an installation which experiences primary side, single phase failures on a Grounded Wye - Grounded Wye transformer which regenerates voltage when unloaded. The algorithm shall also inhibit retransfer to the normal (utility) source upon detection of a single phasing condition until a dedicated timer expires, the alternate source fails, or the normal source fails completely and is restored during this time delay period. The time delays associated with this feature shall be adjustable by the user through the controller keypad and LCD.

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. Power interconnections shall be silver-plated copper bus bar. The only field installed power connections shall be at the service and load terminals of the bypass-isolation switch. All control inter-wiring shall be provided with disconnect plugs.
- C. 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. Designs requiring insertion of loose operating handles or opening of the

enclosure door to operate are not acceptable. 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 the load-carrying source shall be accomplished with no interruption of power to the load (make before break contacts). Designs which disconnect the load when bypassing are not acceptable. The bypass handle shall have three operating modes: "Bypass to Normal," "Automatic," and "Bypass to Emergency." The operating speed of the bypass contacts shall be the same as the associated transfer switch and shall be independent of the speed at which the manual handle is operated. In the "Automatic" mode, the bypass contacts shall be out of the power circuit so that they will not be subjected to fault currents to which the system may be subjected.
 - 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. When the isolation switch is in the "Test" or "Open" mode, the bypass switch shall function as a manual transfer switch.
 - c. Padlocking: Include provisions to padlock the isolating handle in the isolated position.
 - d. Visual verification: The isolation blades shall be visible in the isolated position.
3. Designs requiring operation of key interlocks for bypass isolation or ATSS which cannot be completely withdrawn when isolated are not acceptable.

4. 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.

2.7. IDENTIFICATION SIGNS

- A. Install nameplate identification signs on each ATS including ATS number and name. Nameplates shall be laminated black phenolic resin with a white core, with engraved lettering, a minimum of 6 mm (1/4-inch) high. Secure nameplate with screws.
- B. Provide separate nameplates indicating feeder source information and source room number as follows:
 1. Normal power source and source room number. Nameplates shall be laminated black phenolic resin with a white core, with engraved lettering, a minimum of 6 mm (1/4-inch) high. Secure nameplate with screws.
 2. Emergency, Equipment or Critical power source and source room number. Nameplates shall be laminated red phenolic resin with a white core, with engraved lettering, a minimum of 6 mm (1/4-inch) high. Secure nameplate with screws.

PART 3 - EXECUTION**3.1 INSTALLATION**

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

3.2 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 COTR prior to the final inspection.
- C. When any defects are detected, correct the defects and repeat the test as requested by the COTR, at no additional cost to the Government.

3.3 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.

3.4 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 COTR. Coordinate this training with that of the generator training.

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