

SECTION 26 36 00 – TRANSFER SWITCHES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes automatic transfer switches rated 600V and less, including remote annunciator system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
 - 2. Include material lists for each switch specified.
 - 3. Single-Line Diagram: Show connections between transfer switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
 - 4. Riser Diagram: Show interconnection wiring between transfer switches and annunciators.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer-authorized service representative.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include following:

- a. Features and operating sequences, both automatic and manual.
- b. List of factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA ICS 1.
- C. Comply with NFPA 110.
- D. Comply with UL 1008 unless requirements of these Specifications are stricter.
- E. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.
- F. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under fault conditions indicated, based on testing per UL 1008.
 1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
 2. Short-time withstand capability for 3 cycles.
- G. Repetitive Accuracy of Solid-State Controls: Settings shall be plus or minus 2 percent or better over operating temperature range of minus 20 to plus 70 degrees C.
- H. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested per IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- I. Electrical Operation: Accomplish by non-fused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.
- J. Service-Rated Transfer Switch:
 1. Comply with UL 869A and UL 489.

2. Provide terminals for bonding grounding electrode conductor to grounded service conductor.
 3. In systems with neutral, bonding connection shall be on neutral bus.
 4. Provide removable link for temporary separation of service and load grounded conductors.
 5. Surge Protective Device: Service rated.
 6. Service Disconnecting Means: Externally operated, manual mechanically actuated.
- K. Neutral Terminal: Solid and fully rated unless otherwise indicated.
- L. Annunciation Interface Components: Devices at transfer switches for communicating with annunciators have communication capability matched with remote device.
- M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed tape markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification."
1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
 4. Accessible via front access.
- N. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 MOLDED-CASE-TYPE AUTOMATIC TRANSFER SWITCHES

- A. Transfer switches shall be manufactured by Caterpillar, Cummins, Kohler, or Stewart and Stevenson.
- B. Comply with Level 1 equipment per NFPA 110.
- C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Limitation: Switches using contactor-based components are unacceptable.
 2. Switch Action: Double throw; mechanically held in both directions.
 3. Contacts: Silver composition or silver alloy for load-current switching.
 4. Conductor Connectors: Suitable for use with conductor material and sizes.
 5. Material: Hard-drawn copper, 98 percent conductivity.
 6. Main and Neutral Lugs: Compression type.
 7. Ground Lugs and Bus-Configured Terminators: Compression type.
 8. Connectors shall be marked for conductor size and type per UL 1008.

- D. Automatic Open-Transition Transfer Switches: Interlocked to prevent load from being closed on both sources at same time. Sources shall be mechanically and electrically interlocked to prevent closing both sources on load at same time.
- E. Electric Switch Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.
- F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
- G. Transfer Switches Based on Molded-Case-Switch Components: Comply with UL 489 and UL 869A.
- H. Automatic Transfer-Switch Controller Features:
 - 1. Controller operates through period of loss of control power.
 - 2. Undervoltage Sensing for Each Phase of Normal and Alternative Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 - 3. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
 - 4. Test Switch: Simulate normal-source failure.
 - 5. Switch-Position Pilot Lights: Indicate source to which load is connected.
 - 6. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
 - 7. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10A at 240V ac.
 - 8. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

2.3 TRANSFER SWITCH ACCESSORIES

- A. Remote Annunciator System:
 - 1. Source Limitations: Same manufacturer as transfer switch in which installed.
 - 2. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches.
 - 3. Annunciation panel display shall include following indicators:

- a. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
 - b. Switch position.
 - c. Switch in test mode.
 - d. Failure of communication link.
- 4. Annunciator Panel: LED-lamp type with audible signal and silencing switch.
 - a. Indicating Lights: Grouped for each transfer switch monitored.
 - b. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
 - c. Mounting: Flush, modular, steel cabinet unless otherwise indicated.
 - d. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.4 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect components, assembled switches, and associated equipment per UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.
- B. Prepare test and inspection reports.
 - 1. For each of tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for following conditions:
 - a. Overvoltage.
 - b. Undervoltage.
 - c. Loss of supply voltage.
 - d. Reduction of supply voltage.
 - e. Alternative supply voltage or frequency is at minimum acceptable values.
 - f. Temperature rise.
 - g. Dielectric voltage-withstand; before and after short-circuit test.
 - h. Overload.
 - i. Contact opening.
 - j. Endurance.
 - k. Short circuit.
 - l. Short-time current capability.
 - m. Receptacle withstand capability.
 - n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.
- B. Identify components per Section 260553 "Identification."
- C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
- D. Comply with NECA 1.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to motor controls, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes."
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- D. Ground equipment per Section 260526 "Grounding and Bonding."
- E. Connect wiring per Section 260519 "Low-Voltage Power Conductors and Cables."
- F. Route and brace conductors per manufacturer's written instructions and Section 260529 "Hangers and Supports." Do not obscure manufacturer's markings and labels.
- G. Final connections to equipment shall be made with liquid-tight, flexible metallic conduit no more than **18 inches** in length.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
 - 1. After installing equipment, test for compliance with requirements per NETA ATS.
 - 2. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with Drawings and Specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and required clearances.
 - d. Verify that unit is clean.

- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - f. Verify that manual transfer warnings are attached and visible.
 - g. Verify tightness of control connections.
 - h. Inspect bolted electrical connections for high resistance using one of following methods, or both:
 - 1) Use of low-resistance ohmmeter.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method per manufacturer's published data.
 - i. Perform manual transfer operation.
 - j. Verify positive mechanical interlocking between normal and alternate sources.
 - k. Perform visual and mechanical inspection of surge arresters.
 - l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of draw-out disconnecting contacts, grounding contacts, and interlocks.
3. Electrical Tests:
- a. Perform insulation-resistance tests on control wiring with respect to ground.
 - b. Perform contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
 - c. Verify settings and operation of control devices.
 - d. Calibrate and set relays and timers.
 - e. Verify phase rotation, phasing, and synchronized operation.
 - f. Perform automatic transfer tests.
 - g. Verify correct operation and timing of following functions:
 - 1) Normal source voltage-sensing and frequency-sensing relays.
 - 2) Engine start sequence.
 - 3) Time delay on transfer.
 - 4) Alternative source voltage-sensing and frequency-sensing relays.
 - 5) Automatic transfer operation.
 - 6) Interlocks and limit switch function.
 - 7) Time delay and retransfer on normal power restoration.
 - 8) Engine cool-down and shutdown feature.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages

- and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
- a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least 3 times.
- a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
 - f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
 - g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
- B. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach label or tag to each tested component indicating satisfactory completion of tests.
- C. Transfer switches will be considered defective if they do not pass tests and inspections.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.
- F. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared scan of each switch. Remove access panels so joints and connections are accessible to portable scanner.
1. Instrument: Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 2. Record of Infrared Scanning: Prepare certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
 3. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.4 DEMONSTRATION

- A. Engage factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.
- B. Training shall include testing ground-fault protective devices and instructions to determine when ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating ground-fault protection scheme during testing and circuit modifications.

END OF SECTION