SECTION 26 36 00

**TRANSFER SWITCHES**

**BASED ON DFD MASTER ELECTRICAL SPEC DATED 09/03/24**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

**PART 1 - GENERAL**

**SCOPE**

The work under this section includes transfer switches (less than 600V) for standby generator systems. Included are the following topics:

PART 1 - GENERAL

 Scope

 Related Work

 Referenced Standards

 Quality Assurance

 Submittals

 Operation and Maintenance Data

PART 2 - PRODUCTS

 Automatic Transfer Switches

 Ratings

 Sequence of Operation

 Time Delays

 Accessories

 Elevator Control Interface Accessories

PART 3 - EXECUTION

 Installation

 Field Adjustments

 Testing

 Construction Verification Items

 Agency Training

**RELATED WORK**

Applicable provisions of Division 1 govern work under this section.

Section 26 32 13.13 Engine-Driven Generator Sets – Diesel

Section 26 32 13.16 Engine-Driven Generator Sets – Natural Gas [LP]

Section 26 08 00 - Commissioning of Electrical

Section 01 91 01 or 01 91 02 – Commissioning Process

**REFERENCE STANDARDS**

The following references shall apply to the installation of equipment under this section.

UL 1008- Standard for Transfer Switch Equipment

NFPA 99- Essential Electrical Systems for Health Care Facilities

NFPA 110- Emergency and Standby Power Systems

IEEE Standard 446- IEEE Recommended Practice for Emergency And Standby Power Systems.

NEMA Standard ICS10-1993- AC Automatic Transfer Switches.

**QUALITY ASSURANCE**

Manufacturer: Company specializing in automatic transfer equipment with five years documented experience.

**SUBMITTALS**

Submit product data showing overall dimensions, electrical connections, electrical ratings, withstand current rating (WCR’s), all specified accessories, interlock methods, and environmental requirements.

Submit manufacturer's installation instructions.

# OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS, include instructions for operating equipment under test and emergency conditions.

**PART 2 - PRODUCTS**

**AUTOMATIC TRANSFER SWITCHES**

***The paragraph below is written for open transition automatic transfer switches. Open transition automatic transfer switches shall be the standard specified ATS. The consultant shall consult with DFD staff prior to specifying closed transition automatic transfer switches or manual transfer switches.***

Open Transition Type:

Furnish and install Open Transition Automatic Transfer Switch (ATS) with number of poles, ampere rating, voltage, and withstand ratings as indicated on drawings. Each automatic transfer switch shall consist of a double throw power transfer switch mechanism and microprocessor controller to provide automatic operation. Where multiple switches are required, all shall be by same manufacturer.

***The following two paragraphs are written for closed transition automatic transfer switches. Closed transition automatic transfer switches shall only be utilized for NFPA 99 healthcare applications and specific University of Wisconsin applications where optional standby systems are serving designated critical research or campus specific loads. The consultant shall seek approval from DFD prior to incorporating switches into design. Delete the following two paragraphs if closed transition transfer switches are not used on this project.***

[Closed Transition Type:

Furnish and install Closed Transition Transfer Switch with number of poles, ampere rating, voltage, and withstand rating as indicated on drawings, Each closed transition automatic transfer switch shall consist of a power transfer switch mechanism and a microprocessor controller to provide automatic operation. Where multiple switches are required, all shall be by same manufacturer.

The closed transition automatic transfer switch shall transfer the load without interruption (Closed Transition) by momentarily connecting both sources of power only when both sources are present and acceptable. The maximum interconnection time shall not exceed 100 milliseconds. The unit shall operate as a conventional break before make switch (Open transition) when the power source serving the loads fails.]

Description: NEMA ICS 2; automatic transfer switch.

Configuration: The transfer switch shall be electrically operated and mechanically held. The electrical operation shall be by a solenoid mechanism operating from the same source to which the load is being transferred.

The switch shall be rated for continuous duty and be mechanically interlocked to be in either the normal or the emergency position.

The switch shall be controlled by a single built-in microprocessor with serial communications module. Controller shall be connected to the transfer switch by plug type with associated interconnected wiring harness. Relays shall be industrial grade with dust covers, mounted separate from the transfer switch.

All customer wiring connections shall be to a common terminal block for ease of field wiring.

The switch shall be designed and built so that it can be manually operated under no-load conditions from behind a barrier partition or with the door closed. The enclosure shall allow for inspection of the internal operation of the switch through a full sequence of the transfer cycle with the door open and the switch de-energized.

The switch controller memory shall be non-volatile upon loss of control power.

The switch controller shall not have internal battery backup.

In applications where the switch serves as the service entrance disconnect, the switch shall be rated as suitable for use as a service disconnecting means.

**RATINGS**

***The consultant shall provide the rating and type of each transfer switch on the one line riser diagram. At a minimum the consultant shall provide the following ratings for each switch provided:***

***Voltage***

***Number of switched poles***

***Continuous amperage rating***

***Withstand amperage rating (WCR)***

***Enclosure NEMA type***

***Open or Closed transition type***

Ratings: As scheduled on drawings.

The minimum withstand and closing rating (WCR) shall be the available fault current at the installed location of the transfer switch. Unit shall be rated to close in and withstand the available RMS symmetrical short circuit current at the terminals with the type and rating of overcurrent protection shown on plans. Indicate WRC ratings of transfer switches on One-Line diagrams.

WCR ratings shall not be based on a single manufacturer’s circuit breakers or fuses. Switches shall be tested and listed for use with any manufacturer’s circuit breaker or fuse within its rating or fuse class. Switches shall be tested per UL1008.

**SEQUENCE OF OPERATION**

Controller keypad and display.

Provide minimum 4 line, multi character LCD display and keypad controller for viewing all available data and settings operational parameters. Provide serial communications input port.

The following parameters shall be adjustable via DIP switches: Nominal line voltage and frequency, single or three phase sensing.

Voltage, frequency and phase rotation sensing.

Continuously monitor voltage and frequency on both normal and alternate sources with pickup, drop out and trip setting capabilities.

Voltage and frequency settings shall be field adjustable in 1% increments via keypad or serial communications port.

The controller shall sense the phase rotation of both sources.

Source information shall be indicated on data screen for normal and alternate sources to provide readout of voltage on all phases, frequency and phase rotation.

Time delay settings shall be adjustable utilizing LCD display and keypad or serial communications port.

**TIME DELAYS**

Adjustable time delay of 0 to 6 seconds to override momentary normal source outages and delay all engine start signals.

Adjustable time delay of 0 to 6 seconds to override momentary normal source outages and delay all transfer signals.

Time delay on transfer to alternate source, adjustable from 0 to 30 minutes, upon source monitor and permission by alternate source monitor.

Time Delay before transfer to Normal Source: Upon permission by normal source monitor. An additional time delay module shall provide function for test mode. 0 to 30 minutes, adjustable.

Time Delay Before Engine Shut Down: 0 to 30 minutes, adjustable, unloaded operation.

Operating transfer time of the switch in either direction shall not be greater than 1/6 of a second.

Time Delay activated output signal shall also be provided to control external relays for selective load control. Delays shall be minimum of 0 to 5 minutes in the following modes: prior to transfer, prior to and after transfer, normal to alternate source only, alternate to normal source only, normal to alternate to normal.

The following requirement shall be included for Closed Transition Automatic Transfer Switches. Delete this requirement if closed transition transfer switches are not used on this project.

[1 to 5 minute time delay on failure to synchronize normal and alternate sources prior to closed transition transfer.]

**ACCESSORIES**

Engine Exerciser: Digital control, start engine every 7 to 31 days adjustable; run for 0 to 120 minutes adjustable, before shutting down. Bypass exerciser control if normal source fails during exercising period.

Manual Operator: Provide manual operator to allow switch to be operated under no-load conditions from behind a barrier partition or with the door closed.

Provide three position momentary test switch for the test/ automatic/ reset. The test position will simulate a normal source failure. The reset switch shall bypass the time delays on either transfer to alternate source or retransfer to normal.

Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.

Indicating Lights: LED type. Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, and SWITCH POSITION.

Transfer Switch Auxiliary Contacts: Minimum 2 normally open; 2 normally closed, rated 10 amps. Minimum one shall be closed when ATS is connected to the normal source and one closed when ATS is connected to the alternate source.

The following shall be included for Closed Transition Automatic Transfer Switches. Shunt Trip devices to be indicated on one line drawings. Delete these requirements if closed transition transfer switches are not used on this project.

[Transfer Switch Auxiliary contact: Relay output to operate source overcurrent protective device shunt trip for both normal and alternate source overcurrent protective devices.]

Normal Source Monitor: Monitor each line of normal source voltage; adjustable set points; initiate transfer when voltage drops below 85 percent.

Alternate Source Monitor: Monitor alternate source voltage and frequency; adjustable set points; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 Hertz from rated nominal voltage.

In phase monitor shall control transfer so the motor load inrush currents do not exceed normal starting currents and shall not require external control of power sources.

The switch shall contain an in-phase monitor or adjustable time delay transition to inhibit closing of the switch into high levels of motor residual voltage.

A factory installed equipment ground bar shall be provided in each switch enclosure.

**In general, a 4-pole transfer switch is required on three-phase systems utilizing ground fault protection at the main service entrance. A 3-pole transfer switch shall be specified on systems that do not utilize ground fault protection. Indicate the required number of switched poles in the schedule on the drawings.**

Four-pole transfer switches shall contain an overlapping neutral contact or a fully rated switched neutral pole.

Three-pole transfer switches shall contain a factory installed fully rated solid neutral lug assembly.

**Consultant shall review the need for bypass isolation switches integral with automatic transfer switches with the specific project requirements. In general, bypass isolation is NOT required. However, specific project requirements and essential electrical system configurations of emergency, standby and optional electrical systems may not allow for ATS failure without available options to re-energize system.**

**Pay attention to specific project types including NFPA 99 healthcare applications and university research applications where long-term switch outage is deemed unacceptable.**

**Discuss design concept with DFD electrical staff prior to specifying bypass switches. Note equipment size typically requires floor mounted equipment. Indicate size on drawings.**

**Delete the following requirement if not applicable to the project.**

[Provide Bypass Isolation switches integral with automatic transfer switches.]

Provide digital metering on all transfer switches. Metering shall provide, at a minimum, measurement of voltage, frequency, current and power, energy and power factor on the load side of the switch.

The consultant shall include the following paragraph if required for the project. Delete paragraph if not applicable to project.

**ELEVATOR CONTROL INTERFACE ACCESSORIES**

Transfer switches serving elevators shall be provided with auxiliary contacts designed to provide emergency system status to the elevator controllers. These contacts are in addition to the contacts required elsewhere in this specification. Required auxiliary contacts are as follows:

Emergency standby power signal contact. This shall be a form C contact that will change state and maintain its state as long as the transfer switch has transferred to the emergency power source.

Pre-transfer warning signal contact. This contact shall be activated prior to the operation of the transfer switch, in either direction. These contacts shall change state prior to the transfer of power for a period of time as determined by the elevator installer, typically in the range of 10 to 20 seconds. These contacts shall reset to their normal state after the transfer has taken place. The pre-transfer warning signal shall not delay transfer for a time greater than allowed by the applicable codes.

**PART 3 - EXECUTION**

**INSTALLATION**

Install in accordance with manufacturer's instructions.

Starting contacts for all transfer switches shall be wired to the generator starting circuit so that any transfer switch that senses a loss of normal power will start the generator. In addition, provide start contacts from manual connection cabinet to associated ATS’s. This includes contacts as part of the fire pump controller. This control wiring is not shown on the plans but is required to be provided by the electrical contractor.

All generator control conductors installed between transfer equipment and the emergency generator serving Emergency, Legally Required Standby and Optional Standby systems shall be kept entirely independent of each other and all other wiring. **This shall require a dedicated conduit system between each transfer switch and the emergency generator**.

All Emergency branch control conductors installed between transfer equipment and the emergency generator shall be installed per NEC 700.10(D)(1) through (D)(3).

The consultant shall include the following paragraph if elevator control is provided. Delete paragraph if not applicable to project.

[Wiring between the elevator control contacts and the elevator controllers is not shown on the plans but is required to be provided by the electrical contractor. Terminations at the elevator controller shall be by the elevator installer.]

The consultant shall include the following paragraph if Closed Transition Automatic Transfer Switches are utilized. Delete paragraph if not applicable to project.

[Shunt trip accessories shall be provided on overcurrent protective devices serving both normal and alternate sources of closed transition automatic transfer switches. Shunt trips shall be initiated by transfer switch relay output. Relay shall be or similarly labeled “failure to disconnect”.]

**FIELD ADJUSTMENTS**

The contractor shall field adjust all timing and voltage settings of the transfer switch as necessary for proper operation of the switch, related loads and sources.

The consultant shall edit project specific time delay settings for identified essential electrical system branches. In addition, settings shall be identified at ATS’s on One-Line diagram.

Final transfer switch settings for each transfer switch provided under this project, shall be provided to the owner in hard copy printed format and added to the O&M manuals.

**Time Delay Settings:**

**Emergency Systems Branch (maximum transfer time- 10 seconds)**

Time delay (0-6 sec) to override momentary normal source outages and delay all engine start signals

[3][ ].

Time delay (0-6 sec) to override momentary normal source outages and delay all transfer signals

[0][ ].

Time delay (0-30 minutes) on transfer to alternate source upon source monitor and permission by alternate source [0 sec][ ].

Time delay (0-30 minutes) before transfer to normal [15 min][ ].

Time delay (0-30 minutes) before engine shutdown after transfer from alternate source [15 min][ ].

**Legally Required Standby Systems Branch (maximum transfer time- 60 seconds)**

Time delay (0-6 sec) to override momentary normal source outages and delay all engine start signals

[3][ ].

Time delay (0-6 sec) to override momentary normal source outages and delay all transfer signals

[6][ ].

Time delay (0-30 minutes) on transfer to alternate source upon source monitor and permission by alternate source [20 sec][ ].

Time delay (0-30 minutes) before transfer to normal [15 min][ ].

Time delay (0-30 minutes) before engine shutdown after transfer from alternate source [15 min][ ].

**Optional Standby Systems Branch**

Time delay (0-6 sec) to override momentary normal source outages and delay all engine start signals

[3][ ].

Time delay (0-6 sec) to override momentary normal source outages and delay all transfer signals

[6][ ].

Time delay (0-30 minutes) on transfer to alternate source upon source monitor and permission by alternate source [30 sec][ ].

Time delay (0-30 minutes) before transfer to normal [15 min][ ].

Time delay (0-30 minutes) before engine shutdown after transfer from alternate source [15 min][ ].

The consultant shall include the following time delay if Closed Transition Automatic Transfer Switches are utilized as part of Optional Standby system. If installed as part of NEC 517 Healthcare applications, consult DFD reviewer. Delete paragraph if not applicable to project.

Time delay (1-5 minutes) on failure to synchronize normal and alternate sources prior to closed transition transfer [1 min][ ].

**TESTING**

Maintenance and operational testing shall be per NFPA 110-8.3.

Operational inspection and testing shall be per NFPA 110-8.4.

**CONSTRUCTION VERIFICATION**

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 26 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

**AGENCY TRAINING**

All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01 or 01 91 02.

END OF SECTION