
USACE / NAVFAC / AFCEA / NASA UFGS-26 28 21.00 40 (August 2011)

Preparing Activity: NASA Superseding
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2012

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SECTION 26 28 21.00 40

AUTOMATIC TRANSFER SWITCHES

08/11

NOTE: This guide specification covers the requirements for automatic transfer switches for use with engine-generator sets for standby power.

Adhere to [UFC 1-300-02](#) Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a [Criteria Change Request \(CCR\)](#).

PART 1 GENERAL

NOTE: If Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in

the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text are automatically deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

RCBEA GUIDE (2004) NASA Reliability Centered Building and Equipment Acceptance Guide

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA ICS 1 (2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1008 (2011) Transfer Switch Equipment

UL 508 (1999; Reprint Apr 2010) Industrial Control Equipment

1.2 SUBMITTALS

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be

reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Connection Diagrams[; G][; G, [____]]

Fabrication Drawings[; G][; G, [____]]

Installation Drawings[; G][; G, [____]]

SD-03 Product Data

Equipment and Performance Data[; G][; G, [____]]

Contacts[; G][; G, [____]]

Indicating Lights[; G][; G, [____]]

Terminal Board[; G][; G, [____]]

Enclosures[; G][; G, [____]]

Accessories[; G][; G, [____]]

SD-06 Test Reports

Qualification Testing[; G][; G, [____]]

Operation Tests[; G][; G, [____]]

SD-07 Certificates

Listing of Product Installations[; G][; G, [____]]

SD-08 Manufacturer's Instructions

Automatic Transfer Switch[; G][; G, [____]]

1.3 PREDICTIVE TESTING AND INSPECTION TECHNOLOGY REQUIREMENTS

NOTE: The Predictive Testing and Inspection (PT&I) tests prescribed in section 01 86 26.07 40 RELIABILITY CENTERED ACCEPTANCE FOR ELECTRICAL SYSTEMS are MANDATORY for all [NASA] [____] assets and systems identified as Critical, Configured, or Mission Essential. If the system is non-critical, non-configured, and not mission essential, use sound engineering discretion to assess the value of adding these additional test and acceptance requirements. See Section 01 86 26.07 40 RELIABILITY CENTERED ACCEPTANCE FOR ELECTRICAL SYSTEMS for additional information regarding cost feasibility of PT&I.

This section contains systems and/or equipment components regulated by NASA's Reliability Centered Building and Equipment Acceptance Program. This program requires the use of Predictive Testing and Inspection (PT&I) technologies in conformance with RCBEA GUIDE to ensure building equipment and systems installed by the Contractor have been installed properly and contain no identifiable defects that shorten the design life of a system and/or its components. Satisfactory completion of all acceptance requirements is required to obtain Government approval and acceptance of the Contractor's work.

Perform PT&I tests and provide submittals as specified in Section 01 86 26.07 40 RELIABILITY CENTERED ACCEPTANCE FOR ELECTRICAL SYSTEMS.

1.4 QUALIFICATION TESTING

Provide certified independent laboratory test data for the furnished unit or an identical unit. Ensure tests meet the general use requirements of UL 508, Table 22.1. Subject the complete automatic transfer switch to a test as outlined in NEMA ICS 1, paragraph 109.5. One cycle of operation tests under the UL 508 test requirements consists of a transfer of load from the normal source to the emergency source and retransfer to the normal source. After the required number of test cycles, ensure the temperature rise of the contacts has not exceeded 65 degrees C 149 degrees F. Test the switch operating time and the sense relay pickup and dropout times.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide a complete automatic transfer switch system for use with engine-generator sets for standby power. Submit the following:

- a. Connection diagrams showing the relations and connections of contacts, indicating lights, and terminal board by showing the general physical layout of all controls, the interconnection of one system (or portion

of system) with another.

- b. **Fabrication drawings** for contacts, indicating lights, terminal board enclosures, and accessories consisting of fabrication and assembly details to be performed in the factory.
- c. **Installation drawings** for automatic transfer equipment in accordance with the paragraph entitled, "Installation," of this section.
- d. **Equipment and performance data** for automatic transfer equipment including life, test, system functional flows, safety features, and mechanical automated details.

2.1.1 Design Requirements

Ensure control and protective devices associated with automatic transfer switches are in accordance with Section 26 05 70.00 40 HIGH VOLTAGE OVERCURRENT PROTECTIVE DEVICES and Section 26 05 71.00 40 LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES.

**NOTE: Show required automatic transfer switch
amperage, voltage, and frequency ratings on the
drawings.**

Provide an automatic transfer switch of the two-pole type for single-phase application, and three-pole type for three-phase application. [Provide a solid neutral conductor connection for neutral transfer from normal source to emergency source.] [Provide an additional switched neutral pole.]

2.1.2 Performance Requirements

Provide an automatic transfer switch capable of transferring the load from the normal power source to emergency power source, and from an emergency source to the normal power source. Locate switch where indicated. Provide a switch that is solenoid-operated, mechanically held, double-throw, rated for continuous duty, capable of transferring in 100 milliseconds or less, and conforming to the applicable requirements of **UL 1008** and **NFPA 70**, Article 700, except as herein modified.

Ensure the automatic transfer switch is capable of being placed in either the normal or the emergency position.

2.2 FABRICATION

[2.2.1 Short Circuit Withstand Current Rating

**NOTE: Add to this specification or to the drawings
the short-circuit withstand current rating of the
switch based on the calculated short-circuit current
available at the switch location.**

Provide switch with short-circuit current rating of [____]. Ensure switch is capable of withstanding [____] amperes for a period of [____] seconds without damage.

]2.2.2 Self-Test Capability

Provide an automatic transfer switch with a control-circuit self-test feature capable of verifying the proper operation of the switch control circuit without moving the main contactor or causing discontinuity of service to the load. Include the following characteristics in the self-test circuit:

- a. A key-operated switch that disconnects the main actuator and connects in its place, an indicator light. Design the key-operated switch to prevent removal of the key while the switch is in the self-test mode.
- b. A power-failure simulator switch that removes voltage from the voltage-sensing devices so that emergency power activates the test light.

2.2.3 Enclosures

Provide automatic transfer switch enclosures with solid, unventilated, code-gage 2 millimeter 14-gage, minimum sheet metal, NEMA 250, Type 1, with manufacturer's standard finish.

2.3 COMPONENTS

2.3.1 Contacts

Provide main contacts with a wiping-action silver alloy that, when rated for operation at 50 amperes or greater, are protected against arcing. Ensure auxiliary contacts and control transfer relay contacts have a minimum continuous current rating of not less than 10-amperes inductive at 120 volts ac. Provide the following auxiliary contacts:

- a. Generator-control contacts, normally open, that close on undervoltage or loss of normal power as specified, remaining closed until transfer back to normal power
- b. Emergency-position contacts, normally open when the switch is in the normal position, that close when the switch is in the emergency position
- c. Normal position contacts, normally closed when the switch is in the normal position, that open when the switch is in the emergency position

Use two pole auxiliary contacts.

NOTE: Fill in automatic transfer switch mounting
location, such as: on door of enclosure, remote, or
mounted externally on switchgear.

Provide a test automatic transfer switch mounted [_____] with contacts rated for operation at 10 amperes.

Provide automatic transfer switch with overlapping neutral transfer contacts in addition to the two- or three-pole main bus contacts. Normal and emergency neutral are connected together only during the transfer and retransfer operation. They remain connected only until the power source contacts close/open to transfer from one source to the other. Ensure overlapping neutral transfer contacts connection time does not exceed 100

milliseconds.

2.3.2 Indicating Lights

Furnish automatic transfer switch with two indicating lamps. One light to indicate that the switch is operating on normal power, and the other light to indicate that the switch is operating on emergency power. Fuse each indicating circuit.

2.3.3 Terminal Board

Internally wire control devices, indicating lights, auxiliary contacts, and internal control devices or auxiliary switches to a common output terminal board. Wire the internal functions to facilitate remote connections or monitoring.

2.4 OPERATION

Monitor normal source voltage across phase lines by sensing devices. If the normal source voltage in phase drops to 90 percent or less for a timed period, the automatic transfer switch starts the emergency source and transfer the load to the emergency source when voltage and frequency reach rated values or, if the emergency source is on, verify voltage and frequency of the alternate source and transfer the load to the alternate source. Field adjust this time period from 1 to 30 seconds. Provide a voltage and frequency sensor relay to monitor rated values on the emergency side to prohibit transfer until the emergency source voltage and frequency reach at least 95 percent of the required rating. Provide phase failure protection, with 65 to 70 percent drop and 92 to 95 percent voltage pickup ratings.

Furnish the automatic transfer switch with a time-delay feature, field adjustable from 2 to 30 minutes, that operates to delay automatic transfer back to normal power until the normal source voltage and frequency reach at least 95 percent of the rated voltage. However, if the emergency power fails, and the normal source is again available at 90 percent of the rated voltage, bypass the time-delay circuitry, and the load immediately transferred back to the normal source. Provide capability for manual transfer in either direction. Operate sensing relays without contact chatter or false response during voltage variations between dropout and pickup.

NOTE: Provide schematic wiring diagrams on the
drawings to show this feature.

2.5 ACCESSORIES

NOTE: To be added when the automatic transfer
switch is part of the engine-generator set.

Incorporate with the automatic transfer switch a 24-volt solid-state, high-and low-rate charger complete with rheostat and ammeter, to maintain the engine-generator cranking batteries in a fully charged condition.

Incorporate an engine-generator exerciser timer with the automatic transfer

switch to permit weekly programming of engine-generator set test runs under load.

PART 3 EXECUTION

3.1 INSTALLATION

Install automatic transfer switch as indicated, and in accordance with the manufacturer's installation instructions. Fully align and install wall-mounted enclosures at the indicated mounting height using a minimum of six **M10 3/8-inch** bolts. Use of sheet metal screws or small machine screws is not permitted.

Submit **listing of product installations** for automatic transfer switches showing the manufacturer has successfully manufactured automatic transfer switches of the size specified for a minimum period of 10 years. Include on the list, purchaser, address of installation, service organization, and date of installation.

3.2 FIELD TESTING

NOTE: If the specified system is identified as
critical, configured, or mission essential, use
Section **01 86 26.07 40 RELIABILITY CENTERED**
ACCEPTANCE FOR ELECTRICAL SYSTEMS to establish
predictive and acceptance testing criteria, above
and beyond that listed below.

Perform PT&I tests and provide submittals as specified in Section
01 86 26.07 40 RELIABILITY CENTERED ACCEPTANCE FOR ELECTRICAL SYSTEMS.

Demonstrate the automatic transfer switch operates in accordance with the specification requirements in conjunction with the normal and emergency power sources.

-- End of Section --