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USACE / NAVFAC / AFCESA / NASA	**UFGS-26 36 23 (May 2020)**

Preparing Activity: USACE	**Superseding**
	UFGS-26 36 00.00 10 (October 2007)
	UFGS-26 36 23.00 20 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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DIVISION 26 - ELECTRICAL

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES AND BY-PASS/ISOLATION SWITCH

05/20

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SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES AND BY-PASS/ISOLATION SWITCH
05/20

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NOTE: This guide specification covers the requirements for low voltage applications (600V or less) of automatic transfer switches (ATS) and ATS with by-pass/isolation switches. See TSEWG TP-09 Automatic Transfer Equipment white paper at https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tsewg-tp-09 **See TSEWG TP-19 Static Uninterruptible Power Supply (UPS) white paper at** https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tsewg-tp-19 **This specification supersedes previous versions of 26 36 00.00 10 Automatic Transfer Switch and By-Pass/Isolation Switch and 26 36 23.00 20 Automatic Transfer Switches.**

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-300-02 **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 aas a criteria change request at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/uf
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NOTE: This guide specification is for use when the nature of electrical loads indicates a need for automatic transfer between two power sources. Terminology used depends on the application. "Preferred" and "alternate" should be used when this

specification applies to a stand-by generator system as defined in NFPA 70. The same terminology should be used when switching between different sets of service entrance conductors or between feeders supplied by different transformers. "Normal" and "emergency" should be used for the emergency system application described in NFPA 70.

This specification covers conventional, standard, commercially available equipment appropriate for most Department of Army/Air Force/Navy applications. Special applications may require synchronized, closed-transition transfer, or withdrawal features to facilitate rapid maintenance or repair. Manufacturers of standard ATS may be able to provide ATS for special applications.

Fire pumps may utilize an automatic transfer switch. NFPA 20 describes Arrangement I and Arrangement II. Arrangement I is the most common and it is where the ATS is part of the fire pump controller and Section 21 30 00 FIRE PUMPS is to be used instead of this specification. Arrangement II is a separate ATS from the controller. This is not as common since the switch has to be listed for electric-motor driven fire pump service and there are only a few manufacturers that have this listing.

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NOTE: The following system design requirements are to be adhered to when providing automatic transfer switches:

1. The neutral conductor for each source of supply, including the neutral on separately derived systems, must be switched by the transfer switch.

2. Service rated automatic transfer switches are available (ATS is located on the supply side of the service loads), but this will increase the cost and size of the unit. In many cases it is more cost effective to have the service overcurrent protection ahead of the ATS and this is the recommended approach. If this is not possible or practical, then specify a service rated transfer switch with the appropriate integrated overcurrent protection as part of the transfer switch.

3. Do not use open type transfer switches installed in other equipment such as switchboards.

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NOTE: Use the following related guide specifications for power distribution equipment:
--Section 26 08 00 APPARATUS INSPECTION AND TESTING
Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM
--Section 26 23 00 LOW-VOLTAGE SWITCHGEAR

Do not use the following related guide

specifications except for Army Civil Works projects. They have not been unified:
--Section 26 22 00.00 10 480-VOLT STATION SERVICE SWITCHGEAR AND TRANSFORMERS
--Section 26 28 00.00 10 MOTOR CONTROL CENTERS, SWITCHBOARDS AND PANELBOARDS

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NOTE: Show the following information on the project drawings:

1. The available fault current at the bus feeding the automatic transfer switch.

2. The rating of the overcurrent device protecting the automatic transfer switch.

3. Identify automatic transfer switches to be provided with By-pass/Isolation Switches, when applicable.

4. Identify control type, i.e., Utility-Generator, Preferred Utility Source, or Generator-Generator, for each automatic transfer switch.

5. Identify automatic transfer switches to be provided with "transfer time delay"/"time delay transition" or "in-phase monitor" features, where applicable.

6. Identify automatic transfer switches to be used for fire pump service, when applicable.

****

PART 1 GENERAL

1.1 REFERENCES

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.

ASTM INTERNATIONAL (ASTM)

ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D709	(2017) Standard Specification for Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 602	(2007) Recommended Practice for Electric Systems in Health Care Facilities - White Book

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2017; Errata 2017) Standard for

Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2018) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 2	(2000; R 2005; Errata 2008) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2015) Application Guideline for Terminal Blocks
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 20	(2018; ERTA 1 2018; TIA 18-1; TIA 18-2) Standard for the Installation of Stationary Pumps for Fire Protection
NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 99	(2021) Health Care Facilities Code
NFPA 110	(2016) Standard for Emergency and Standby Power Systems

UNDERWRITERS LABORATORIES (UL)

UL 508	(2018) UL Standard for Safety Industrial Control Equipment
UL 1008	(2014) Transfer Switch Equipment
UL 1066	(2012; Reprint Mar 2017) UL Standard for Safety Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

1.2 RELATED REQUIREMENTS

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NOTE: Include this paragraph on Navy projects; otherwise, delete.

****

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, and Section 26 08 00 APPARATUS INSPECTION AND TESTING, applies to this section, with the additions and modifications specified herein.

1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit

the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified 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 Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification 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

Automatic Transfer Switch Drawings[; G][; G, [_____]]

SD-03 Product Data

Automatic Transfer Switches[; G][; G, [_____]]

BY-PASS/ISOLATION SWITCH (BP/IS)[; G][; G, [_____]]

Remote Annunciator Panel[; G][; G, [_____]]

REMOTE ANNUNCIATOR AND CONTROL SYSTEM PANEL[; G][; G, [_____]]

SD-06 Test Reports

Acceptance Checks and Tests[; G][; G, [_____]]

Functional Acceptance Tests[; G][; G, [_____]]

Factory Testing[; G][; G, [_____]]

Factory Test Reports[; G][; G, [_____]]

Factory Testing -Medical Facilities[; G][; G, [_____]]

SD-07 Certificates

Proof of Listing[; G][; G, [_____]]

SD-10 Operation and Maintenance Data

Operation and Maintenance Manual, Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, Data Package 5[; G][; G, [_____]]

1.4 OPERATION AND MAINTENANCE MANUAL

Assemble and bind manuals in durable, hard-covered, water resistant binders. Assemble and index the manuals per the following table of contents:

a. Manufacturer's O&M per "SD-10 Operation and Maintenance Data".

b. Catalog data required by "SD-03 Product Data"

c. Drawings required by "SD-02 Shop Drawings".

1.4.1 Additions to Operation and Maintenance Manuals

In addition to requirements of SD-10 Data Package 5, include the followings on the actual equipment provided:

a. An outline drawing, front, top, and side views.

b. Prices for spare parts and supply list.

c. Date of Purchase.

d. Corrective maintenance procedures.

e. Operating manual outlining step-by-step procedures for system startup, operation, and shutdown.

f. Include simplified wiring and control diagrams in the manual for system as installed.

g. Provide typical contact voltage drop readings under specified conditions for use during periodic maintenance. Provide instructions for determination of contact integrity.

[1.4.2 Spare Parts

****
NOTE: Do not provide spare parts for Navy projects.
****

Furnish the following the following minimum spare parts and any other

spare parts required in one-year operation, of the same material and workmanship, meeting the same requirements, and interchangeable with the corresponding original parts.

a. Fuses: Two of each type and rating.

]1.5 QUALITY ASSURANCE

1.5.1 Proof of Listing

Submit proof of listing by UL 1008.

1.5.2 Automatic Transfer Switch Drawings

Include the following as a minimum:

a. An outline drawing, including front, top, and side views.

b. Provide a nameplate of corrosion-resistant material with not less than 3 mm 1/8 inch tall characters showing manufacturer's name and equipment ratings. Mount nameplate to front of enclosure and meet the nameplate requirements of NEMA ICS 2.

c. Provide detail drawings that include manufacturer's name and catalog number, electrical ratings, total system transfer statement, reduced normal supply voltage at which transfer to the alternate supply is initiated, transfer delay times, short-circuit current rating, wiring diagram, description of interconnections, testing instructions, acceptable conductor type for terminals, tightening torque for each wire connector, and other required UL 1008 markings.

d. Submit interface equipment connection diagram showing conduit and wiring between ATS and related equipment. Provide diagrams showing interlocking provisions and cautionary notes, if any.

e. Drawings are to indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.5.3 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated

1.5.4 Standard Product

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship, and:

a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.

b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.5.4.1 Alternative Qualifications

Products having less than a 2-year field service record are acceptable if the manufacturer has been regularly engaged in the design and production of automatic transfer switches and if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.5.4.2 Material and Equipment Manufacturing Date

Products manufactured more than 1 years prior to date of delivery to site are not acceptable.

1.6 DELIVERY AND STORAGE

Protect equipment placed in storage from humidity and temperature variations, moisture, water intrusion, dirt, dust, or other contaminants. In harsh environments where temperatures exceed non-operational parameters established within this specification, provide an environmentally controlled equipment storage facility to ensure temperature parameters are within equipment specification. Provide documentation of same to the Government when storage is implemented.

1.7 ENVIRONMENTAL CONDITIONS

****
NOTE: Do not use this paragraph and subparagraphs for the Navy.
****

Provide an ATS that is suitable for prolonged performance under following service conditions:

a. Operating altitude: Sea level to 1,000 meters 3,300 ft. (Systems applied at higher altitudes are to be derated in accordance with the manufacturer's instructions).

b. Operating ambient temperature range:-[-4][_____] to [40][_____] degrees C [40][_____] to [104][_____] degrees F.

c. Operating relative humidity: 0 to 90 percent, without condensation.

[1.8 SEISMIC REQUIREMENTS

****
NOTE: Do not use this paragraph for Navy projects. When directed to meet Seismic Requirements, 13 48 73 SEISMIC CONTROL FOR MECHANICAL EQUIPMENT and Section 26 05 48.00 10 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT must be edited to suit the project and be included in the contract documents. Edit the following paragraph and include it in the project

specification. When a Government designer is the Engineer of Record, provide seismic requirements on the drawings.
****

Provide seismic details[conforming to[Section 13 48 73, SEISMIC CONTROL FOR MECHANICAL EQUIPMENT][and to][Section 26 05 48.00 10, SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT]][as indicated].

]PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCHES

****
NOTE: Withstand closing current ratings listed in UL 1008 should be used when fault currents are less than withstand closing current rating listed. However, in no case should withstand current rating be less than 10,000 amperes.

Where closed-transition transfer is required, coordinate system design requirements with power supplier.

Delete BP/IS requirements if not applicable. Delete reference to IEEE 602 if not applicable.
****
****
NOTE: UFC 3-520-01 Interior Electrical Systems requires the neutral to be switched for grounded systems. The alternate power source is considered a separately derived system when the neutral is switched per the National Electrical Code.

Sizing of neutral bus, pole, contacts, and terminations should consider harmonic currents. Harmonic currents tend to have a high zero phase sequence component, which are additive in neutral circuit. Neutral ampere rating may need to be higher than phase contacts.
****
****
NOTE: Select the following options for switches to be installed in facilities complying with UFC 4-510-01, Design: Military Medical Facilities located at : (a) Switches utilizing circuit breakers are not acceptable; (b) "Automatic Transfer Switches are to be provided with drawout construction. Verify requirements with latest version.

NOTE: Option "Switches utilizing circuit breakers are not acceptable." If not a medical facility, is a chose by the designer.
****
Each automatic transfer switch must be rated and marked for total system transfer and have the current and voltage ratings as indicated. Provide a switch operating mechanism that is electrically operated, have quick-make, quick-break, load break contacts, and be mechanically held in both positions. [Switches utilizing circuit breakers are not acceptable.]

Provide an ATS that is UL listed. ATS must be manufactured and tested in accordance with applicable requirements of NEMA ICS 2, UL 1008 and UL 1066. ATS must conform to NFPA 110. Provide the ATS with the following characteristics:

a. Voltage: [_____] volts [ac][dc].

b. Amperage: [_____] amps [ac][dc]. Provide an ATS with a continuous load current rating of the switch rating.

c. Number of Phases: [Three][One].

d. Number of Wires: [Four][Three][Two].

e. Frequency: [60][50] Hz.

f. Poles: [Four switched][Three switched][Two switched]. [One of the poles is the neutral.]

g. ATS Withstand Current Rating: Rated to withstand closing current short-circuit current of [_____] amperes, RMS symmetrical.

h. Nonwelding Contacts: Provide contacts that are nonwelding at the available fault current rating.

****

NOTE: It is standard to have the ATS with contacts rated at the same value as the main contacts. Requesting a 200 per cent contacts for the neutral is an option, but can increase the cost and size of the transfer switch. Increasing the neutral needs to be considered where the majority of the load is non-linear, which can result in increased neutral current.

****

i. [Phase and Neutral] [Phase] Contacts: Provide contacts with silver alloy composition. [Provide neutral contacts with the same continuous current rating as main or phase contacts.] [Provide neutral contacts with 200 percent the current rating of the phase contacts.]

****

NOTE: Per NFPA 70, emergency, legally required standby, and critical operations power systems require the ATS to be listed for emergency use.

****

j. Configuration. Provide an ATS for use in [emergency systems][legally required standby system][optional standby systems][critical operations power systems] described in NFPA 70. [Provide an ATS that is listed for emergency use.]

****

NOTE: Open transition is the default choice. Closed transition may be required with some UPS. Closed transition requires coordination with the local utility. See UFC 3-540-01 Engine-Driven Generator Systems for Prime and Standby Power Applications.

****

k. ATS Configuration. [Provide an open transition ATS.][Neutral is to break and make with the phase contacts.][Phase contacts are to break and make, but the neutral is to make before break (overlap).][Provide a closed transition ATS.]

****

NOTE: The circuit breaker should be rated for 100%. Lower amperages may have the breaker rated for 80%. Default is 100%

****

[l. Service Entrance Rated. Provide an integrated circuit breaker and automatic transfer switch. Provide a separate deadfront compartment for the circuit breaker on switches 600 amp and larger. Provide label indicating that the ATS is the service disconnect. Provide a circuit breaker that is rated for [100%][80%] of the switch contact current rating. All components, except as noted herein, are to havea continuous load rating.

] **********

NOTE: Provide this option for Medical Facilities. This is not a common option.

****

[m. Viewing Ports. Provide contacts that are viewable from the front of the device when the door is open. Comply with the requirements found in IEEE 602 and NFPA 99

]

****

NOTE: Choose only if a NFPA 20 rated ATS is required for the fire pump

****

[n. Fire Pump Service. Provide a manual operating means that is externally operable without opening the enclosure on transfer switches for fire pump service. The manual means is to open and close the switch contacts at the same rate of speed as that caused by the automatic operation of the switch. The ATS is to meet the requirements found in NFPA 20.

]

2.1.1 Undervoltage Sensing - Normal/Preferred Source

****

NOTE: Where utility type power source is used and application is standard, monitoring devices should drop out at 85 percent of nominal value and pick up at 90 percent. Where precise power is monitored, protection should be specified with monitoring devices set to drop out at 90 percent of nominal and pick up at 95. In applications requiring closer regulation, solid state or microprocessor arrangement may be used with pickup and dropout response adjusted as close as 2 percent differential. However, for these applications a redundant uninterruptible power supply should be considered.

****

Undervoltage Sensing - Normal Source. Provide undervoltage sensing for each phase in the normal/preferred source. Sense low phase-to-ground

voltage on each phase. Provide sensing circuit with adjustable dropout, 75-98 percent of nominal value and adjustable pickup, 85-100 percent of nominal value. Factory set dropout value to [85][90][80][_____]percent. Factory set pickup value to [90][95][_____]percent.

2.1.2 Adjustable Time Delay - Override Transfer

****

NOTE: ATS operation should not be initiated during low voltage conditions attributed to a fault or to momentary dips or excursions (transients) in normal or preferred power source. Time delay before monitored source override should exceed associated circuit breaker tripping time and normal system voltage instability periods. Minimum of 1 second is recommended.

****

Adjustable Time Delay - Override Transfer. For override of normal-source voltage sensing to delay transfer[and engine starting] signals. Engine starting control contacts with adjustable commit-to-start delay circuit, 0.0-6.0 seconds. Factory set at [1][0.5][_____]second[s].

2.1.3 Voltage/Frequency Lockout Relay - Alternate/Emergency Source

Voltage/Frequency Lockout Relay. Prevent premature transfer to alternate/emergency source. Provide pickup voltage that is adjustable from 85-100 percent of nominal. Factory set for pickup at [90][_____] percent. Provide pickup frequency that is adjustable from 90-97 percent of nominal. Factor set frequency pickup for [95][_____] percent.

2.1.4 Adjustable Time Delay - Transfer to Alternate/Emergency Power Source

****

NOTE: Provide transfer to emergency or alternate source time delay for the transfer switches requiring delayed-automatic operation. For an emergency power source choose 0 seconds.

Use nonzero setting where multiple ATS require staggered application of load steps to alternate or emergency source.

****

Adjustable Time Delay - Transfer to Alternate Power Source. Transfer to alternate power sourcesource time delay for transfer switches as indicated, adjustable 0-5 minutes. Factory set to [0][_____] seconds. ATS is to monitor the frequency and voltage of alternate power source and transfer when frequency and voltage are stabilized.

2.1.5 Adjustable Time Delay- Re-transfer to Normal/Preferred Source

****

NOTE: Typical factory setting is 10 minutes.

****

Adjustable Time Delay- Transfer to Source. Re-transfer to normal source time delay, adjustable 0-30 minutes. Factory set at [10][_____] minutes. Time delay is automatically defeated upon loss or sustained undervoltage of alternate power source, provided that normal source has been restored.

[2.1.6 Engine-Generator Exerciser

****

NOTE: Use this paragraph when automatic system exercising is required by nature of loads and desired reliability. Automatic system exerciser is recommended when diesel engine driven generator set is used, but only if automatic feature is manually initiated and can be manually overridden during exercise period to return ATS to normal or preferred source.

Consult ATS manufacturers' literature for feature availability, timing interval range, and pickup and dropout settings. Insert proper values for application.

****

Exerciser. Solid-state, programmable-time switch exerciser to allow automatic starting of the generator set, subsequent load transfer, retransfer of load and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from on a daily, weekly, bi-weekly or monthly basis.. Running periods are adjustable from 10-30 minutes. Factory settings are for 7-day exercise cycle, 20 minute running period and 5-minute cool-down period. Exerciser features include the following:

a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer or dual independent exercisers that allow for unloaded and loaded schedule testing.

b. Push-button programming control with digital display of settings.

c. Integral battery operation of time switch when normal control power is not available.

][2.1.7 Engine Shutdown Time Delay

****

NOTE: Omit this paragraph if there is no generator in transfer scheme. Recommended values for normal applications are shown in brackets but may be changed for other design conditions. Where values are not shown or different settings are required, specify values and settings.

****

Engine Shutdown. Provide time delay that is adjustable from [0][_____] to [5][_____] minutes and is factory set at [5][_____] minutes.

][2.1.8 Engine Starting Contacts

****

NOTE: The standard is one normally closed and one normally open contact. Choose the others values if additional contacts are required.

****

Provide [1][2][3][4] isolated normally closed and [1][2][3][4] isolated normally open contact that is rated 5 A at 250 VAC/30 VDC minimum.

][2.1.9 Controls for Fire Pump Service Automatic Transfer Switch

****

NOTE: The following paragraph is intended for use when the automatic transfer switch is to be used for fire pump service where the ATS is not part of the fire pump controller.

****

Provide the following additional controls features:

Phase reversal of the normal source is to initiate transfer to the emergency/alternate source.

][2.1.10 Delayed Transition With Time Delay Neutral

****

Transferring large motor or other inductive loads such as transformers requires special consideration. The motor will act like a generator momentarily and a transformer needs to have its magnetic field collapse. If a transfer happens, the transformer or motor may not be in-phase with the new power source. There are two general methods to address this issue: a contact transfer time delay (neutral position delay or timed transition) and in-phase monitor. The time delay allows the residual voltage of the motors to decay to a safer level. In-phase monitor allows transfer when the phase angle between the load and the source are within the preset parameters and provides minimum service interruption; however, this approach is not recommended. Instead, i the extra time is a factor, then the motor loads should be separately disconnected by the ATS and restarted in sequence after the transfer. See TSEWG TP-9 for more information.

Wound-rotor motors are not suitable for in-phase or the time delay approach. These motors should be isolated and restarted.

****

Provide an adjustable time delay transition for indicated transfer switches to allow safe transfer of highly inductive loads between two non-synchronized sources. This transfer between loads has a programmed neutral position arranged to provide a midpoint between the two working positions, with an intentional time-controlled pause at midpoint during transfer. Pause is adjustable from 1 to 300 seconds. Factory set time delay at [0.5][1][2][5] seconds. Time delay occurs for both transfer directions. Manufacturer is to provide recommendations for establishing the length of the time delay.

][2.1.11 Motor Disconnect And Timing Relay

****

NOTE: If the delayed transition with time delay neutral is too long for other critical loads, then this option allows sending a signal to the motor controller to prevent coming on line with the

alternate/emergency source. Then signal is sent to sequence these loads on the new source. Delete if not required.
****

Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

][2.1.12 Make Before Break Neutral
****

NOTE: If the project has a transformerless UPS, then this option needs to be considered. Some manufacturers for transformerless UPS 60 kVA and below require the neutrals to be briefly connected during the transfer. The default value is 50 ms. Since this varies with manufacturer, the first choice requires the Contractor to coordinate this item. The second choice if for when it is known. See TSEWG TP-19 Static Uninterruptible Power Supply (UPS) white paper at https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tsewg-tp-19
****

[Contractor is required to coordinate withe UPS manufacturer to determine if the unit being procurred requires the neutral to be interconnected. If not required, then break before make neutral contacts are allowed. If required, then provide the ATS with make before break neutral contacts.][Provide the ATS with a make before break neutral. Phase contacts are to break before make.] The neutrals are to make for [50][_____] ms.

][2.1.13 Auxiliary Contact for Uninterruptible Power Supply
****

NOTE: Projects with a generator as an alternate power source that will be powering an Uninterruptible Power Supply may want to have a signal sent to the UPS from the ATS. This signal would have the UPS limit the charging current to a lower level, so as not to potentially increase the generator size. Other factors such a size of UPS compared to the entire load and expected length of generator runtime should be taken into account.
****

Provide a contact that closes when transferred to the alternate power source.

]2.1.14 Unassigned Auxiliary Contacts
****

NOTE: Provide at least three contacts for each position on Medical Facilities and for all other facilties provide at least two contacts. The standard is 10 amps at 240 volts. Edit appropriately for the project.
****

Provide [two][three][_____] normally open and [two][three][_____] normally closed, single-pole, double-throw auxiliary contacts for each switch position rated at [10][15][_____] amperes at [240][120][480][_____] volts.

2.1.15 Front Panel Devices

Provide devices mounted on cabinet front consisting of:

a. Mode selector switch with the following positions and associated functions. Selector switch can be part of the microprocessor controller consisting of an LCD screen with a graphical interface or as a stand-alone test switch.

   (1) TEST - Simulates loss of normal/preferred source system operation.

   (2) NORMAL - Transfers system to normal/preferred source bypassing re-transfer time delay.

b. Switch position indicating lights or graphical LCD display. Indicate source to which load is connected.

c. Source-Available Monitor. Provide source-available indicating lights or graphical LCD display monitor that is labeled to show when one or both sources of power are available. If indicating lights are used, then the prefernce is to have Green be normal/preferred power and Red be for alternate/emergency power; however, other color schemes are allowes if clearly marked..

****

NOTE: The transfer override switch is typically an option on an standard ATS. Overrides transfer back to the power source regardless of the condition of the power source.

****

d. Provide a transfer override switch. Provide automatic transfer switch microprocess or based controller, which offers field selectable/adjustable inputs and outputs for transfer switch operation. Override switch must bypass automatic transfer controls so ATS will transfer and remain connected to [alternate][emergency][generator][_____] power source, regardless of condition of normal/preferred source. Provide an indicating light to show override status. [If [alternate][emergency] source fails and [normal][preferred] source is available, ATS is to automatically retransfer to [normal] [preferred] source.]

e. Lamp test button.

[2.1.16 Voltage Unbalance

****

NOTE: If the power system has a large number of motors then consider adding this requirement.

****

Provide automatic transfer switch controller or control logic to include positive and negative sequence voltage detection to identify a phase loss condition that can adversely effect motor loads.

][2.1.17 Closed-Transition Transfer Switch

****

NOTE: The typical transfer switch operates in an open-transition manner; however, there are times the closed-transition makes sense. See TSEWG TP-19 Static Uninterruptible Power Supply (UPS) white paper at https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tsewg-tp-19 **for a discussion on the topic. Delete if not required.**

****

Include the following functions and characteristic for an automatic transfer switch that is to operate in a closed-transition manner.

a. Fully automatic make-before-break operation.

b. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms, but no less than 50 ms.

c. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

(1) Initiation occurs without active control of generator.

(2) Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

d. Failure of power source serving load initiates automatic break-before-make transfer.

][2.1.18 In-Phase Monitor

****

NOTE: A Closed-transition type ATS needs to have the in-phase monitor option.

In addition, UFC 4-510-01 Design: Military Medical Facilities needs to be consulted for its requirements. The current version requires an ATS feeding high efficiency motors rated 25 hp or larger to be provided with an in-phase monitor.

****

Provide an in-phase monitor that consists of a factory-wired, internal relay that controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 5 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage Manufacturer is to provide information regarding what conditions a transfer cannot be accomplished.

][2.2 BY-PASS/ISOLATION SWITCH (BP/IS)

****

NOTE: Include by-pass/isolation switches only where the nature of the loads make continuance of power essential when the associated ATS switch is disconnected for repairs, preventive maintenance, or testing. Consult UFC 4-510-01 Design: Military Medical Facilities and UFC 3-540-01 Engine-Driven Generator Systems for Prime and Standby Power Applications for when a by-pass/isolation switches for automatic transfer switches to be provided. Delete reference to generator starting where a generator is not used as alternate source.
****

Include load-break by-pass/isolation switches for the indicated automatic transfer switches that are arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined by-pass/isolation switch and automatic transfer switch:

a. Bypass/isolation switch (BP/IS) and associated ATS are to be made by the same manufacturer and must be completely interconnected and tested at factory and at project site as specified.

b. ATS is to be manufactured, listed and tested in accordance with paragraph AUTOMATIC TRANSFER SWITCH. BP/IS switch current, voltage, closing, and short-circuit withstand closing ratings are to be equal or exceed comparable ratings specified for ATS and have the same phase arrangement and number of poles.

c. Provide externally operated and arranged selector switch or handle so designed and constructed not to stop in an intermediate or neutral position during operation and that one person can safely bypass the ATS. Accomplish isolation of the ATS externally by one person without opening a door. Provide interlocks that ensure ATS is disconnected from source and load during isolation. Interlocks prevent ATS operation, except for testing and mainteance, while isolated. BP/IS operation is to be accomplished without disconnecting switch load terminal conductors.

d. Provide drawout transfer switch that provides physical separation from bypass switch and live parts and accessibility for testing and maintenance operation.

e. Provide contacts that have the same contact temperature that do not exceed those of the ATS contacts when carrying rated load. Provide contacts as specified for associated ATS, including provisions for inspection of contacts without disassembly of BP/IS or removal of entire contact enclosure. Provide manufacturer instructions for determining contact integrity in order To facilitate maintenance.

f. The ATS controls remain functional with the ATS isolated or in bypass mode to permit monitoring of the normal power source [and automatic starting of the generator in the event of a loss of the normal power source]. In the isolated mode, the bypass section is capable of functioning as a manual transfer or automatic switch to transfer the load to either power source. The ATS can be completely removed from the enclosure, if required for maintenance or repair, while the bypass section continues to power the load.

h. Construct Bypass/isolation switch for convenient removal of parts from front of switch enclosure without removal of other parts or disconnection of external power conductors.

i. Achieve load by-pass to the source with no load interruption or a load interruption of not more than 0.16 seconds unless the time delay (neutral time delay) option is used.

****

NOTE: Optional operational items. Chose those required for project. Drawout bypass is normally available on those with 150 amp or greater ratings.

****

[j. Provide drawout bypass switch that provides physical separation from ATS and live parts and accessibility for testing and maintenance operation. [Provide automatic shutters that closed to isolate the bus.]
]
[k. Provide a means to ensure the switch is transferred to the alternate or emergency power source when normal power source becomes unavailable.
]

2.2.1 Markings

Mark isolation handle positions with engraved plates or other approved means to indicate position or operating condition of associated ATS, as follows:

a. Provide an indication that shows that BP/IS section is providing power to the load.

b. Provide indication of ATS isolation/test position.

c. Provide suitable control labels and instruction signs describing operating instructions.

d. Indicating lamps or LCD screen for indicating that shows the source availability, bypass switch position, transfer switch position, and isolation handle position. If indicating lights are used, provide a lamp test button that turns the indicating lights on, but does not cause any function to take place.

2.2.2 Interconnection

Interconnect BP/IS and associated ATS with suitably sized copper bus bars silver-plated at each connection point, and braced to withstand magnetic and thermal forces created at withstand current rating specified for associated ATS.

]2.3 ENCLOSURE

****

NOTE: Designer must provide normal power source to ATS when specifying enclosure heater.

If ATS assembly is provided, equipment should be installed in free-standing, floor-mounted enclosure as specified, except when manufacturer incorporates switch specified in wall-mounted enclosure as standard construction. However, in some

applications it is advisable to specify that ATS or BP/IS components be mounted in separate switchboard, switchgear, motor control center, or other enclosure. Investigate conditions and options and specify accordingly.
****

Provide an enclosure that meets the following:
****
NOTE: The option on providing screened and filtered intake and exhaust vents are not available by all manufacturer, even by an option. Choose only if required by the site conditions for the ATS.
****

a. Provide ATS and accessories in a [free-standing, floor-mounted][wall-mounted], [ventilated][unventilated] NEMA 250, Type [1][3R][4][4X][12], smooth sheet metal enclosure constructed in accordance with applicable requirements of NEMA ICS 6, UL 508, UL 1066, and UL 1008. [Provide screened and filtered intake vents. Provide screened exhaust vents.] [Provide door with suitable hinges, locking handle latch, and gasketed jamb.] Provide at least No. 14 metal gauge.

b. Factory wiring within enclosure and field wiring terminating within enclosure must comply with NFPA 70. Provide wire that is permanently tagged or marked near terminal at each end with wire number shown on approved detail drawing, when wiring is not color coded. Conform terminal block to NEMA ICS 4. Arrange terminals for entrance of external conductors from [top and bottom][top][bottom] of enclosure as shown. Main switch terminals, including neutral terminal if used, must be pressure type suitable for termination of external [copper] [aluminum] conductors shown.
****
NOTE: The option on a controlled heater is typically only available on those units which require a NEMA 3R or similar enclosure.
****

[c. Provide thermostatically controlled heater within enclosure to prevent condensation over temperature range stipulated in paragraph SERVICE CONDITIONS.]

2.3.1 Construction

Construct enclosure for ease of removal and replacement of ATS components and control devices from front without disconnection of external power conductors or removal or disassembly of major components.

2.3.2 Cleaning and Painting

Protect both the inside and outside surfaces of an enclosure, including means for fastening against corrosion by enameling, galvanizing, plating, powder coating, or other equivalent means. Protection is not required for metal parts that are inherently resistant to corrosion, bearings, sliding surfaces of hinges, or other parts where such protection is impractical. Provide manufacturer's standard finish material, process, and color that is free from runs, sags, peeling, or other defects. An enclosure marked Type 1, 3R, 4 or 12 is acceptable if there is no visible rust at the conclusion of a salt spray (fog) test using the test method in ASTM B117,

employing a 5 percent by weight, salt solution for 24 hours. Type 4X enclosures are acceptable following performance of the above test with an exposure time of 200 hours.

2.3.3 Field Fabricated Nameplates

Nameplate is to comply with ASTM D709. Provide laminated plastic nameplates for each equipment enclosure as specified or as indicated on the drawings. Provide an inscription on each nameplate that identifies the name of the equipment, sources of power, calculated short circuit with date and the location e.g. 'SWB-1 Electrical Room 103'. Provide nameplates that are made of melamine plastic, 3 mm 0.125 inch thick, white with [black][_____] center core. Provide the nameplate with a surface that is matte finished and that has square corners.. Accurately align lettering and engrave into the core. Provide nameplates that are at least 25 by 65 mm 1.0 by 2.5 inches with a minimum lettering size of 6.35 mm 0.25 inch high normal block style.

[2.4 REMOTE ANNUNCIATOR PANEL

****

NOTE: This option is just for a remote annunciator without any means of control. If this is required do not choose the 'Remote annuciator Controller'. There are two types of panels indicated: one is a simple panel with indicating lights and switches, the other is a touchscreen panel. Touchscreen is becoming more common.

****

[Provide remote annunciation with LED indicating lights, an audible alarm with silence switch as well as all appropriate labeling.] [or] [Provide a remote annunciator panel that utilizes a touchscreen human machine interface (HMI). Minimum screen size is 175 mm7 inches.] The annunciator is to be configured to handle [1][2][_____] transfer switches. Provide a surface mounted cabinet. Provide built-in power supply that accepts either 24 VDC or 120VAC or [_____]. Provide a remote annunciation panel to annunciate the following conditions for the indicated transfer switch(es).

a. Sources available

b. Switch position.

c. Switch in test mode.

d. Failure of communication link.

][2.5 REMOTE ANNUNCIATOR AND CONTROL SYSTEM PANEL

****

NOTE: This option is for a combination remote annunciator and control system panel. If this is chosen be sure to delete the previous 'Remote Annuciator Panel' option.

****

Provide a remote annunciator and control system that utilizes a touchscreen human machine interface (HMI) with the ability to remotely

monitor and control multiple transfer switches from a single panel. Minimum screen size is 7 inches175 mm. Provide password protection and date/time stamped alarm history. The controller is to have internal battery backup. In the event of a communication link failure, the system is to automatically revert to stand-alone, self-contained operation. Automatic transfer switch sensing, controlling or operating function is not to depend on remote panel for proper operation. Provide a surface mounted cabinet. Communication is to be by a [Modbus] RS-485 connection. The annunciator controller is to be configured to monitor and control [1][2][_____] transfer switches.

2.5.1 Monitor

Monitor the following:

a. Sources available

b. Switch position.

c. Switch in test mode.

d. Overvoltage

e. Failure of communication link.

****

NOTE: Delete option if none of the sources are a generator.

****

[f. Engine test or exercise.
]

2.5.2 Alarm Screen

Alarm for the following conditions:

a. Alternate source closed

b. Undervoltage

c. Lockout.

2.5.3 Control Functions

Provide a means to perform the following functions from the controller: an alarm silence button in addition to monitoring the following items:

a. Control of switch-test initiation.

b. Control of switch operation in either direction.

c. Control of time-delay bypass for transfer to normal source.

d. Control to perform an engine test.

****

NOTE: This option can be beneficial to allow remote chanes, but it can also be a concern with the security.

****

[e. Provide a means to remotely configure transfer switch controller setpoints. The means to perform these changes must be password protected.
]

****
NOTE: Provide if a large system and want to be able to remotely control the various ATSs.
****

[f. Manage up to eight (8) transfer switches from a single remote annunicator and control panel
]

]2.6 FACTORY TESTING

Submit a description of proposed field test procedures, including proposed date and steps describing each test, its duration and expected results, not less than [_____] weeks prior to test date. Submit certified factory and field test reports, within 14 days following completion of tests. Provide reports that are certified and dated and that demonstrate that tests were successfully completed prior to shipment of equipment.

2.6.1 Prototype Factory Testing

A prototype of specified ATS is to be factory tested in accordance with UL 1008. In addition, perform factory tests on each ATS as follows:

a. Insulation resistance test to ensure integrity and continuity of entire system

b. Main switch contact resistance test.

c. Visual inspection to verify that each ATS is as specified.

d. Mechanical test to verify that ATS sections are free of mechanical hindrances.

e. Electrical tests to verify complete system electrical operation and to set up time delays and voltage sensing settings.

2.6.2 Factory Test Reports

Provide three certified copies of factory test reports from the manufacturer.

[2.7 FACTORY TESTING -MEDICAL FACILITIES

****
NOTE: The factory tests sequence listed below is required for Medical Facilities only. This testing is normally above and beyond the standard factory test performed on an ATS.
****

The factory tests for ATS and By-Pass/Isolation switches used in medical facilities must be conducted in the following sequence:

a. General

b. Normal

c. Overvoltage

d. Undervoltage

e. Overload

f. Endurance

g. Temperature Rise

h. Dielectric Voltage-Withstand

i. Contact Opening

j. Dielectric Voltage-Withstand (Repeated)

k. Withstand

l. Instrumentation and Calibration of High Capacity

m. Closing

n. Dielectric Voltage-Withstand (Repeated)

o. Strength of Insulating Base and Support

]PART 3 EXECUTION

3.1 INSTALLATION

Installation must conform to the requirements of NFPA 70 and manufacturer's recommendation.

3.2 PREREQUISITES FOR FUNCTIONAL ACCEPTANCE TESTING

Completion of the following requirements is mandatory prior to scheduling functional acceptance tests for the automatic transfer switch.

3.2.1 Performance of Acceptance Checks and tests

Complete as specified in paragraph entitled "Acceptance Checks and Tests". The Acceptance Checks and Tests are to be accomplished by the Testing organization as described in Section 26 08 00 APPARATUS INSPECTION AND TESTING.

3.2.2 Manufacturers O&M Information

The manufacturers O&M information required by the paragraph entitled "SD-10 Operation and Maintenance Data", is to be submitted to and approved by the Contracting Officer.

3.2.3 Test Equipment

Ensure all test equipment and instruments is on hand prior to scheduling field tests, or subject to Contracting Officer's approval, evidence must be provided to show that arrangements have been made to have the necessary equipment and instruments on site prior to field testing.

3.3 FIELD QUALITY CONTROL

****

NOTE: Use of 26 20 00 is only required on Navy projects.

****

Give Contracting Officer 15 days notice of dates and times scheduled for tests which require the presence of the Contracting Officer. The Contracting Officer will coordinate with the using activity and schedule a time that will eliminate or minimize interruptions and interference with the activity operations. The contractor is responsible for costs associated with conducting tests outside of normal working hours and with incorporating special arrangements and procedures, including temporary power conditions. The contractor provides labor, equipment, apparatus, including test load, and consumables required for the specified tests. Calibration of all measuring devices and indicating devices must be certified. Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and start-up of the equipment specified under this section. The manufacturer's representative is to provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly components contained herein. [Provide a test load that is a cataloged product in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.] Perform the following field tests in accordance with the manufacturer's recommendations and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.3.1 Automatic Transfer Switch Acceptance Checks and Tests

a. Visual and Mechanical Inspection

(1) Compare equipment nameplate data with specifications and approved shop drawings.

(2) Inspect physical and mechanical condition.

(3) Confirm correct application of manufacturer's recommended lubricants.

(4) Verify that manual transfer warnings are attached and visible.

(5) Verify tightness of all control connections.

(6) Verify tightness of accessible bolted connections by calibrated torque-wrench method. Thermographic survey is not required.

(7) Perform manual transfer operation.

(8) Verify positive mechanical interlocking between normal and alternate sources.

b. Electrical Tests

(1) Measure contact-resistance. Correct values that exceed 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.

(2) Perform insulation-resistance on each pole, phase-to-phase and

phase-to-ground with switch closed, and across each open pole for one minute. Perform tests in both source positions.

(3) Verify settings and operations of control devices.

(4) Calibrate and set all relays and timers.

[(5) Test ground-fault protective device.]

3.3.2 Functional Acceptance Tests

****
NOTE: Edit for the appropriate generator specification, if the project has a generator.
****

Functional Acceptance Tests must be coordinated with Section 26 32 15.00 ENGINE-GENERATOR SET STATIONARY 15-2500 KW, WITH AUXILIARIES.[Functional Acceptance Test must be coordinated with Section 21 30 00 FIRE PUMPS.] Include simulating power failure and demonstrating the following operations for each automatic transfer switch. Demonstrate in service that the automatic transfer switches are in good operating condition, and function not less than five times.

a. Perform automatic transfer tests:

(1) Simulate loss of normal/preferred power.

(2) Return to normal/preferred power.

(3) Simulate loss of emergency/alternate power.

(4) Simulate all forms of single-phase conditions.

b. Verify correct operation and timing of the following functions:

(1) Normal source voltage-sensing relays.

(2) Engine start sequence.

(3) Time delay upon transfer.

(4) Alternate source voltage-sensing relays.

(5) Automatic transfer operation.

(6) Interlocks and limit switch function.

(7) Time delay and retransfer upon normal power restoration.

[(8) By-pass/isolation functional modes and related automatic transfer switch operations.]

3.3.3 Infrared Scanning

After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

a. Follow-up Infrared Scanning: Perform an additional follow-up infrared

scan of each switch 11 months after acceptance.

b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 TRAINING

Provide 4 hours of training to maintenance personnel on the proper operation, maintenance and adjustment of the automatic transfer switch. [Coordinate this training with that of the generator equipment.]

-- End of Section --