SECTION 26 36 00.00 10

AUTOMATIC TRANSFER SWITCH AND BY-PASS/ISOLATION SWITCH
04/17

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	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 602	(2007) Recommended Practice for Electric Systems in Health Care Facilities - White Book
IEEE C37.13	(2015) Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures
IEEE C37.90.1	(2013) Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2000; R 2015) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 10 Part 2	(2005) AC Transfer Equipment, Part 2: Static AC Transfer Equipment
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2015) Terminal Blocks
NEMA ICS 6	(1993; R 2011) Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 110	(2016) Standard for Emergency and Standby Power Systems
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04	(2013) Seismic Design for Buildings

UNDERWRITERS LABORATORIES (UL)

UL 1008	(2014) Transfer Switch Equipment
UL 1066	(2012; Reprint Jul 2013) Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

Equipment

Installation

SD-03 Product Data

Equipment

SD-06 Test Reports

Testing

SD-07 Certificates

Equipment

Switching Equipment

SD-10 Operation and Maintenance Data

Switching Equipment

Instructions

1.3 QUALITY ASSURANCE

1.3.1 Detail Drawings

Submit interface equipment connection diagram showing conduit and wiring between ATS and related equipment. Submit schematic, external connection, one-line schematic and wiring diagram of each ATS assembly. Device, nameplate, and item numbers shown in list of equipment and material shall appear on drawings wherever that item appears. Diagrams shall show interlocking provisions and cautionary notes, if any. Operating instructions shall be shown either on one-line diagram or separately. Unless otherwise approved, one-line and elementary or schematic diagrams shall appear on same drawing.

1.3.2 Switching Equipment

Upon request, manufacturer shall provide notarized letter certifying compliance with requirements of this specification, including withstand current rating (WCR). Submit evidence that ATS withstand current rating (WCR) has been coordinated with upstream protective devices as required by UL 1008. Submit an operating manual outlining step-by-step procedures for system startup, operation, and shutdown. Manual shall include manufacturer's name, model number, service manual, parts list, and brief description of equipment and basic operating features. Manufacturer's spare parts data shall be included with supply source and current cost of recommended spare parts. Manual shall include simplified wiring and control diagrams for system as installed.

1.4 SITE CONDITIONS

Seismic requirements shall be as specified in UFC 3-310-04 and Sections 13 48 00 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT and 26 05 48.00 10 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT. ATS shall be suitable for prolonged performance under following service conditions:

Altitude	390 meters above mean sea level
Relative Humidity	50 percent maximum, continuous
Temperature	Minus 6 to Plus 130 degrees F degrees F
Seismic Parameters	Zone 3

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide material and equipment which are standard products of a manufacturer regularly engaged in manufacturing the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Submit list of proposed equipment and material, containing a description of each separate item, and certificates of compliance showing evidence of UL listing and conformance with applicable NEMA standards. Such certificates are not required if manufacturer's published data, submitted and approved, reflect UL listing or conformance with applicable NEMA standards. The experience use shall include applications in similar circumstances and of same design and

rating as specified ATS. Equipment shall be capable of being serviced by a manufacturer-authorized and trained organization that is, in the Contracting Officer's opinion, reasonably convenient to the site.

2.2 NAMEPLATE

Nameplate showing manufacturer's name and equipment ratings shall be made of corrosion-resistant material with not less than 1/8 inch tall characters. Nameplate shall be mounted to front of enclosure and shall comply with nameplate requirements of NEMA ICS 2.

2.3 AUTOMATIC TRANSFER SWITCH (ATS)

ATS shall be electrically operated and mechanically held in both operating positions. ATS shall be suitable for use in emergency systems and standby systems described in NFPA 70. ATS shall be UL listed. ATS shall be manufactured and tested in accordance with applicable requirements of IEEE C37.90.1, IEEE C37.13, IEEE C62.41.1, IEEE C62.41.2, IEEE 602, NEMA ICS 1, NEMA ICS 2, NEMA ICS 10 Part 2, UL 1008 and UL 1066. ATS shall conform to NFPA 110. To facilitate maintenance, manufacturer's instruction manual shall provide typical maximum contact voltage drop readings under specified conditions for use during periodic maintenance. Manufacturer shall provide instructions for determination of contact integrity. ATS shall be rated for continuous duty at specified continuous current rating. ATS shall be fully compatible and approved for use with BP/IS specified. BP/IS shall be considered part of ATS system. ATS shall have following characteristics:

Voltage	As Specified
Number of Phases	As Specified
Number of Wires	As Specified
Frequency	60 Hz
Poles	As Specified
ATS WCR	Rated to withstand specified short-circuit current (amperes, RMS symmetrical).
Nonwelding Contacts	Rated for nonwelding of contacts when used with upstream feeder overcurrent devices shown and with available fault current specified.
Main and Neutral Contacts	Contacts shall have silver alloy composition. Neutral contacts shall have same continuous current rating as main or phase contacts unless specified otherwise to accompodate non-linear loads

2.3.1 Override Time Delay

Provide adjustable time delay to override monitored source deviation from 0.5 to 6seconds and factory set at 1 second. ATS shall monitor phase conductors to detect and respond to sustained voltage drop of 15percent of nominal between any two normal or preferred source conductors and initiate transfer action to alternate/emergency source and start engine driven generator after set time period. Pickup voltage shall be adjustable from 85to 100 percent of nominal and factory set at 90percent. Dropout voltage shall be adjustable from 75to 98 percent of pickup value and factory set at 85 percent of nominal.

2.3.2 Transfer Time Delay

Time delay before transfer to alternate/emergency power source shall be adjustable from 0to 5minutes and factory set at 0 minutes. ATS shall monitor frequency and voltage of alternate/emergency power source and transfer when frequency and voltage are stabilized. Pickup voltage shall be adjustable from 85to 100 percent of nominal and factory set at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal and factory set at 90 percent.

2.3.3 Return Time Delay

Time delay before return transfer to normal/preferred power source shall be adjustable from 0 to 30 minutes and factory set at 30 minutes. Time delay shall be automatically defeated upon loss or sustained undervoltage of alternate/emergency power source, provided that normal/preferred supply has been restored.

2.3.4 Engine Shutdown Time Delay

Time delay shall be adjustable from 0 to 30 minutes and shall be factory set at 10 minutes, or as specified.

2.3.5 Exerciser

Provide a generator exerciser timer. Run times shall be user programmable. The generator exerciser shall be selectable between load transfer and engine run only, and shall have a fail-safe feature that will retransfer the ATS to normal/preferred during the exercise period.

2.3.6 Auxiliary Contacts

Two normally open and two normally closed auxiliary contacts rated at 10 amperes at 120480volts shall operate when ATS is connected to normal/ preferred power source, and two normally open and two normally closed contacts shall operate when ATS is connected to alternate/emergency source.

2.3.7 Supplemental Features

ATS shall be furnished with the following:

a. Engine start contact.

b. AlternateEmergency source monitor.

c. Test switch to simulate normal power outage.

d. Voltage sensing. Pickup voltage adjustable from 85 to 100 percent of nominal; dropout adjustable from 75 to 98 percent of pickup.

e. Time delay bypass switch to override return time delay to normal.

f. Manual return-to-normal switch.

g. Means shall be provided in the ATS to insure that motor/transformer load inrush currents do not exceed normal starting currents. This shall be accomplished with either in-phase monitoring, time-delay transition, or load voltage decay sensing methods. If manufacturer supplies an in-phase monitoring system, the manufacturer shall indicate under what conditions a transfer cannot be accomplished. If the manufacturer supplies a time-delay transition system, the manufacturer shall supply recommendations for establishing time delay. If load voltage decay sensing is supplied, the load voltage setting shall be user programmable.

2.3.8 Operator

Manual operator conforming to UL 1008 shall be provided, and shall incorporate features to prevent operation by unauthorized personnel. ATS shall be designed for safe manual operation under full load conditions. If manual operation is accomplished by opening the door, then a dead-front shall be supplied for operator safety.

2.3.9 Override Switch

Override switch shall bypass automatic transfer controls so ATS will transfer and remain connected to alternate/emergency power source, regardless of condition of normal/preferred source. If alternate/emergency source fails and normal/preferred source is available, ATS shall automatically retransfer to normal/preferred source.

2.3.10 Green Indicating Light

A green indicating light shall supervise/provide normal/preferred power source switch position indication and shall have a nameplate engraved NORMAL or PREFERRED.

2.3.11 Red Indicating Light

A red indicating light shall supervise/provide alternate/emergency power source switch position indication and shall have a nameplate engraved ALTERNATE or EMERGENCY.

2.4 BY-PASS/ISOLATION SWITCH (BP/IS)

2.4.1 Design

Bypass/isolation switch (BP/IS) shall permit load by-pass to either normal/preferred or alternate/emergency power source and complete isolation of associated ATS, independent of ATS operating position. BP/IS and associated ATS shall be products of same manufacturer and shall be completely interconnected and tested at factory and at project site as specified. BP/IS shall be manufactured, listed, and tested in accordance with paragraph AUTOMATIC TRANSFER SWITCH (ATS) and shall have electrical ratings that exceed or equal comparable ratings specified for ATS. Operating handles shall be externally operated and arranged so that one

person can perform the bypass and isolation functions through the operation of a maximum of two handles within 5 seconds. The ATS shall have provisions for locking in the isolation position. Handle for manual operation shall be permanently attached to operating mechanism. BP/IS operation shall be accomplished without disconnecting switch load terminal conductors. Isolation handle positions shall be marked with engraved plates or other approved means to indicate position or operating condition of associated ATS, as follows:

a. Indication shall be provided to show that ATS section is providing power to the load.

b. Indication shall be provided of ATS isolation. The ATS controls shall 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 shall be capable of functioning as a manual transfer switch to transfer the load to either power source. The ATS shall be capable of undergoing functional operation testing without service interruption. The ATS may also be completely removed from the enclosure, if required for maintenance or repair, while the bypass section continues to power the load.

2.4.2 Switch Construction

Bypass/isolation switch shall be constructed for convenient removal of parts from front of switch enclosure without removal of other parts or disconnection of external power conductors. Contacts shall be as specified for associated ATS, including provisions for inspection of contacts without disassembly of BP/IS or removal of entire contact enclosure. To facilitate maintenance, manufacturer shall provide instructions for determination of contact integrity. BP/IS and associated ATS shall be interconnected with suitably sized copper bus bars silver-plated at each connection point, and braced to withstand magnetic and thermal forces created at WCR specified for associated ATS.

2.5 ENCLOSURE

ATS and accessories shall be installed in wall-mounted, free-standing, floor-mounted, ventilated, unventilated NEMA ICS 6, Type 1, 3R, 4, or 12, smooth sheet metal enclosure constructed in accordance with applicable requirements of UL 1066 and UL 1008. Intake vent shall be screened and filtered. Exhaust vent shall be screened. Door shall have suitable hinges, locking handle latch, and gasketed jamb. Thermostatically controlled heater shall be provided within enclosure to prevent condensation over temperature range stipulated in paragraph SERVICE CONDITIONS. Metal gauge shall be not less than No. 14. Enclosure shall be equipped with at least two approved grounding lugs for grounding enclosure to facility ground system using No. 4 AWG copper conductors. Factory wiring within enclosure and field wiring terminating within enclosure shall comply with NFPA 70. If wiring is not color coded, wire shall be permanently tagged or marked near terminal at each end with wire number shown on approved detail drawing. Terminal block shall conform to NEMA ICS 4. Terminals shall be arranged for entrance of external conductors from as shown. Main switch terminals, including neutral terminal if used, shall be pressure type suitable for termination of external copper conductors shown.

2.5.1 Construction

Enclosure shall be constructed 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. Enclosure of ATS with BP/IS shall be constructed to protect personnel from energized BP/IS components during ATS maintenance.

2.5.2 Cleaning and Painting

Both the inside and outside surfaces of an enclosure, including means for fastening, shall be protected 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. Finish shall be manufacturer's standard material, process, and color and shall be free from runs, sags, peeling, or other defects.

2.6 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 2 weeks prior to test date. Submit certified factory and field test reports, within 14 days following completion of tests. Reports shall be certified and dated and shall demonstrate that tests were successfully completed prior to shipment of equipment.

2.6.1 Factory Testing

A prototype of specified ATS shall be factory tested in accordance with UL 1008. In addition, factory tests shall be performed 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

Manufacturer shall provide three certified copies of factory test reports.

2.7 FACTORY TESTING (MEDICAL FACILITIES)

The factory tests for ATS and By-Pass/Isolation switches used in medical facilities shall 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

2.7.1 Viewing Ports

ATS and BP/IS switches shall be of draw-out construction. Viewing ports to inspect the contacts without requiring disassembly shall be provided.

2.7.2 Operating Handles

The operating handles shall be externally operated, and designed and constructed not to stop in an intermediate or neutral position during operation, but shall permit load by-pass and transfer switch isolation in no more than two manual operations which can be performed by one person in 5 seconds or less. The transfer speed will be independent of the operational speed of the switch handle or handles.

PART 3 EXECUTION

3.1 INSTALLATION

ATS shall be installed as shown and in accordance with approved manufacturer's instructions.

3.2 INSTRUCTIONS

Manufacturer's approved operating instructions shall be permanently secured to cabinet where operator can see them. One-line and elementary or schematic diagram shall be permanently secured to inside of front enclosure door.

3.3 SITE TESTING

Following completion of ATS installation and after making proper adjustments and settings, site tests shall be performed in accordance with manufacturer's written instructions to demonstrate that each ATS functions satisfactorily and as specified. Advise Contracting Officer not less than 5 working days prior to scheduled date for site testing, and provide certified field test reports within 2 calendar weeks following successful completion of site tests. Test reports shall describe adjustments and settings made and site tests performed. Minimum operational tests shall include the following:

3.3.1 Insulation Resistance

Insulation resistance shall be tested, both phase-to-phase and phase-to-ground.

3.3.2 Power Failure of Normal Source

Power failure of normal source shall be simulated by opening upstream protective device. This test shall be performed a minimum of five times.

3.3.3 Power Failure of Emergency Source

Power failure of emergency source with normal source available shall be simulated by opening upstream protective device for emergency source. This test shall be performed a minimum of five times.

3.3.4 Low Phase-to-Ground Voltage

Simulate low phase-to-ground voltage for each phase of normal source.

3.3.5 Operation and Settings

Verify operation and settings for specified ATS features, such as override time delay, transfer time delay, return time delay, engine shutdown time delay, exerciser, auxiliary contacts, and supplemental features.

3.3.6 ATS and BP/IS Functions

Verify mannual and automatic ATS and BP/IS functions.

-- End of Section --