SECTION 16250

AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not limited to the following:
   1. Examine all other sections for work related to those other sections and required to be included as work under this section.
   2. General provisions and requirements for electrical work.

1.02 SUBMITTALS

A. Submit product data sheets for all switches, relays, controllers, power supplies, cabinets, etc.

B. Submit detailed shop drawings including dimensioned plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts and cabinets.

C. Submit worst case voltage drop calculations on control circuits.

D. Quality Control
   1. General
      The equipment shall be listed, labeled and approved for the application shown in the contract documents, as building code mandated, emergency electrical power supply equipment, complying with the most recent version of the install requirements of the following Applicable standards. The following standard shall become requirements of and are included in the contract documents:
   2. Underwriters Laboratory – UL
      a. UL – 1008 Standards for Transfer Switch Equipment.
      b. UL – 508 Industrial Control Equipment
   3. National Fire Protection Agency – NFPA
      a. NFPA – 70 National Electrical Code.
      b. NFPA – 99 Essential Electrical Systems.
      c. NFPA – 101 Emergency and Standby Power Systems.
   4. National Electrical Equipment Manufacturer's – NEMA
      a. NEMA – IESCIO AC Automatic Transfer Switches.
   5. Institute of Electrical and Electronic Engineers – IEEE
      a. IEEE – 446 Recommended Practices for Emergency and Standby Power Systems for Commercial and Industrial Applications.
   6. IEC
      a. IEC-947.6.1 Low Voltage switchgear and Controlgear; Multifunction Equipment; Automatic Transfer Switching Equipment.

PART 2 - PRODUCTS

2.01 TRANSFER SWITCH MECHANISM

A. General

1. Provide automatic transfer switch (ATS) system, with quantity of poles, amperage, voltage and withstand ratings as shown on the plans. The system shall be the product of one manufacturer.
2. The ATS shall be rated for all classes of loads including 100-percent tungsten filament lamp loads, electric induction motor loads and solid state switching power supply loads. As manufactured by ASCO, Russell or Zenith controls.

B. Operation

1. Electrical operation shall be accomplished by a momentarily energized single direct operating mechanism, which receives power from the source to which the load is being transferred. Fuse or thermal protection of the main operation shall not be required to ensure compliance and/or correct operation. The total operating transfer time shall not exceed one-sixth of a second (10 Hz). Mechanical locking in each position shall be accomplished without the aid of springs, latching solenoids, gear mechanisms or motor operators.
2. Operation shall be inherently double-throw where all contacts move simultaneously and with no programmed delay in a mid position. Electrical spacing shall not be less than those listed in Table 15.1 of U.L. Std. #1008. Main contact structures not originally manufactured for transfer switch service are not acceptable. An overload or short circuit shall not cause the switch to go to a neutral position.
3. Inspection and replacement of all main and arcing contacts (moveable and stationary) shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.
4. A U.L. listed manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to stop the contacts at any point throughout the entire travel including points of contact make and break.
5. ATS shall be four (4) pole Phase-A, Phase-B, Phase-C plus switched neutrals, with fully rated neutral transfer contacts which momentarily (100 milliseconds, max.) interconnect the neutrals of the sources during the transfer/retransfer operation. The neutrals shall remain interconnected through the main contacts until the phase contacts close on the alternate source. Phase and neutral contacts shall be driven by one single main operator.]

2.02 CONTROL PANEL

A. General

A separately mounted logic panel with solid state sensing and timing functions, shall provide the following operational characteristics:

1. Time delay on momentary dips in normal source (adjustable 0.5-6.0 seconds), set at 1.0 seconds.
2. Time delay on transfer to emergency for controlled loading of generator (0-5 minutes adjustable 0 to 300 seconds. Set at 0 seconds for each ATS supplying building code mandated emergency electrical loads. Set at 15-second sequential additional incremental intervals for each additional ATS supplying electrical loads that are not mandated for emergency standby power source by building code regulations.
3. Time delay on retransfer to normal after restoration of normal source(adjustable 0-30 minutes), set at 15 minutes.
4. Selector switch to manually bypass time delay on retransfers.
5. Time delay on engine shutdown (engine cool down) after retransfer to normal (adjustable 0-15 minutes), set at 5 minutes.

6. Close differential voltage sensing of all normal source phases (adjustable pick-up 85-100 percent of nominal and drop out 75-98 percent of pick-up), set at 85 percent drop out and 95 percent pickup.
7. Independent voltage (adjustable 85-100 percent pick-up) and frequency (adjustable 90-100 percent pick- up) sensing of the emergency source to prevent premature transfer, set at 90 percent voltage and 95 percent frequency.
8. Test switch for both test with load and test without load(momentary type).
9. Gold plated 10 ampere engine-starting contacts (1-N.C. and 1-N.O.) rated 120 volt A.C. or D.C.
10. Visual annunciators to indicate ATS connection position (white on normal, yellow on emergency, red for common trouble.
11. Auxiliary contacts each D.P.D.T.(one relay to operate on normal "N" and one relay to operate on emergency "E") rated 10 ampere 480 VAC.
12. An in-phase monitor shall be provided to control transfer/retransfer operation between live sources so that closure on the alternate source will occur only when the two sources are approaching synchronism and at the instant when the two sources are within plus/minus 60 electrical degrees, max. The monitor shall function over a frequency difference range of plus/minus 2-hertz min., with a maximum total transfer operating time of one-sixth of a second (10 Hz. In the event of abnormal frequency difference (in excess of plus/minus 2 hertz) and/or failure of the load-carrying source, the monitor shall be automatically bypassed. The monitor shall not require interwiring with generator controls nor active control of generator.
13. All time delay and sensing functions shall be readily field adjustable over the ranges indicated and operate without drift over minus 4 degrees Fahrenheit to 158 degrees Fahrenheit. The logic panel shall be provided with a protective cover and isolation plug in wiring harness between control panel and main transfer panel.
14. Automatic engine generator exerciser to provide adjustable 30 minute to 60 minute duration generator start-run and stop sequence, one time per week or one time every two weeks. Exercising sequence shall be field selectable with or without load connection and with or without load bank connection. The exerciser shall provide automatic (activate-deactivate) separate control of the engine generator load bank when a load bank is provided with the engine generator system. Note: Where more than one ATS is provided as part of contract work, only the master ATS shall be furnished with automatic engine generator exerciser feature.
15. Visual annunciators shall indicate availability of normal and emergency power sources and automatic transfer switch position. A prominent and detailed instruction plate shall be furnished.
16. Emergency engine generator "stop" pushbutton with lockout, manual reset and audio/visual alarm annunciation.

B. Automatic Monitoring, Management and Load Controls
1. Where more than one (1) automatic transfer switch (ATS) is included in the contract scope of work, provide each ATS with microprocessor based, software controlled, Programmable Logic Controller (PLC). The engine generator shall also be provided with software Programmable Logic Controller (PLC). The PLC units and operating software shall be compatible/interoperable with all of the other PLC and software units connected at engine generators, annunciators and ATS equipment.
2. The PLC shall provide monitoring and visual display of engine generator and ATS analog and digital operating parameters including output voltage, output frequency and output demand load.
3. In the event of an engine generator overload, the PLC shall automatically disconnect (shed) respective ATS load causing the overload condition.
4. The ATS load shedding process shall prioritize load "shedding" and load "adding" by ATS load types connected to the respective ATS, and shall provide software adjustable time delay for each load "shed" and load "add" priority level.

5. The ATS building units supplying building code mandated emergency loads (i.e., life safety exit egress lighting, fire alarm, etc.) shall have the highest priority to remain connected and for "first" connected to the engine generator. Loads connected to other ATS units that are not mandated by building codes (i.e., non life safety loads – refrigerators, UPS, computers, air conditioning, equipment, etc.) shall have the lower priorities to remain connected to the engine generator. The PLC load "shed" and load "add" priorities shall be software programmable.
6. The PLC shall provide visual/audio alarm annunication of the overload condition(s), engine generator system status/alarms each ATS load connection status and load priority start, at each engine generator location, respective engine generator remote annunciator panel and at the respective ATS.
7. The PLC shall communicate the ATS load shed and load add command controls to the respective PLC equipment in each ATS unit, and assign each ATS with a separate individual load shed and load add priority.
8. The PLC shall provide selective load "lockout" with manual reset upon shed or time delay automatic load restore of each ATS after a load shed event has occupied, software programmable at the PLC.
9. Provide the PLC equipment in the engine generator, in engine generator remote annunciators, in each automatic transfer switches (ATS) and at the building main fire alarm control panel. Provide PLC common digital/multiplex communications protocols and operating software, to ensure correct, error-free interoperability among all the PLC units and related equipment.
10. The PLC color display screen with LCD based "touch screen" function, shall display operating status and alarms of each engine generator, and each ATS unit. 10-inch (nominal) diagonal or larger LCD screen size. PLC non-volatile memory storage shall store in memory a minimum of 30-days display information, plus the operating software program controls. Interface port for plug-in connection of portable lap-top computer interface to provide uploading to the PLC software programs and downloading system operating information from the lap-top computer.
11. Each PLC shall be rated for operation in the same ambient environments and vibration conditions as the engine generator and respective ATS units.

2.03 ELECTRICAL AND MECHANICAL PERFORMANCE

A. General

The system shall comply with U.L. Std. #1008 and NEMA Standard. ICS 2-447. In addition, the switch shall meet or exceed the following requirements and be verified by certified independent laboratory test data:

1. Temperature Rise: Measurements shall be made after the overload and endurance test.
2. Withstand: U.L. listed to withstand the magnitude of fault current available 100,000 ampere RMS symmetrical at the switch terminals when coordinated with respective line side protective devices as shown on the plans at X/R ratio of 6.6 or less.
4. Dielectric: Tested after the withstand test at 1960 VAC r.m.s. minimum.
5. Voltage Surge: Control panel voltage surge withstand test per IEEE Std. 472-1974 and voltage impulse withstand test per ICS-1-109.

2.04 HOUSING ENCLOSURE

A. General

1. The automatic transfer switch [and bypass/isolation switch] system shall be supplied in a common NEMA 1 enclosure with a barrier between the compartments. Rust inhibitor prime undercoat with manufacturer's standard color finish final coat of paint.
2. The complete system shall be factory assembled, wired and tested prior to shipment.

B. Connections
   1. All line voltage power interconnections shall be silver-plated copper bus bar.
   2. Incoming line and load terminations shall be provided for top, bottom and side entry. Rear access to the transfer switch assembly shall not be required. Entire automatic switch assembly shall be constructed for front accessible only.

PART 3 - EXECUTION

3.01 GENERAL

A. The manufacturer shall certify that the complete unit meets or exceeds the seismic requirements of the California Administrative Code Titles 21 and 24.

B. Certification: The manufacturer shall provide a notarized letter certifying compliance with all the requirements of this specification. The certification shall identify, by serial number(s), the equipment involved.

3.02 ELECTRIC POWER AND CONTROL CIRCUITS

A. General
   1. Provide NEC Class-1, Division-1 explosion-proof conduit fittings and seals on each conduit entering or exiting the engine generator location from the ATS.
   2. Terminal blocks with barriered terminals shall be provided for all control wiring terminator points. Control wiring shall be run in horizontal and vertical, isolated, internal metal wireways and shall be carried across hinges in laced bundles. Wire terminators shall be crimp-on type spade terminal
   3. Secondary control wiring shall be minimum of 14 AWG stranded copper type SIS 600 volt insulation.
   4. Control circuits shall have circuit number tags at each termination or break in the wire to match circuit numbers on terminal strips and control wiring diagrams.
   5. Provide quantity and AWG conductor size/type capacity, circuit conductor "lug" connection landings, compatible with connections shown on the drawings.

B. Additional Conduit Homeruns

   1. Provide the following minimum quantity and size conduit and wire, to connect each ATS controls and annunciators. Install the conduit and wire from each ATS to the respective engine generator, monitoring and control equipment. Refer to drawings for additional requirements. Install conduit underground and/or concealed in building structure at all locations.
      a. 1.25-inch conduit – 3 #10 and two digital multiplex communication control circuits from each automatic transfer switch (ATS) to each engine generator and remote engine generator annunciator panel for programmable logic controller (PLC)) ATS, engine monitoring/control, load add, and overload shedding."]
      b. ATS feeder circuits for generator source, normal source and load feeders.
      c. 0.75-inch 6#14 to fire alarm control panel for fire alarm system monitoring and control of ATS.

END OF SECTION