ATTACHMENT B: SECTION 26 32 23

AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

PART 1 GENERAL

1.1 S/C - SCOPE

This section provides two automatic transfer switches that include but are not limited to enclosures, switch mechanisms, controls, operator interfaces, and the additional features specified herein.

The automatic transfer switches provided under this specification section will be purchased directly by the Owner from a generator manufacturer's authorized distributor ("Supplier") for installation by the construction contractor ("Contractor") under a separate construction contract providing renovations to an existing facility to construct a new data center facility.

Assignment of specification compliance responsibilities is defined in this specification section by the inclusion of the terms "S" (Supplier) and "C" (Contractor) at the beginning of the specification paragraphs. However, the equipment supplier and construction contractor shall coordinate with each other in completion of the work specified herein to provide a complete and operable system. The term "S/C" indicates contract provisions that apply to both the Supplier and the Contractor.

The automatic transfer switch installation and related work shall conform to the requirements of all applicable specification sections and drawings issued as a part of the overall project construction contract

1.2 S/C - REFERENCE CODES AND STANDARDS

A. The automatic transfer switches shall conform to the requirements of the following codes and standards for the editions currently in effect:

1. UL 1008 - Standard for Transfer Switch Equipment
2. IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment
3. NFPA 70 - National Electrical Code
4. NFPA 99 - Essential Electrical Systems for Health Care Facilities
5. NFPA 110 - Emergency and Standby Power Systems
6. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
7. NEMA Standard ICS 10-2005, Electromechanical AC Transfer Switch Equipment.
8. EN61000-4-4 Fast Transient Immunity Severity Level 4
9. EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)

10. IEEE 472 (ANSI C37.90A) Ring Wave Test
11. IEC Specifications for EMI/EMC Immunity (CISPR 11, IEC 1000-4-2, IEC 1000-4-3, IEC 1000-4-4, IEC 1000-4-5, IEC 1000-4-6, IEC 1000-4-8, IEC 1000-4-11)
12. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

1.3 S/C - SYSTEM DESCRIPTION

A. System includes: Automatic transfer switches. Subsystems and auxiliary components and equipment shall be as indicated or specified. Provide all labor, materials, and equipment to furnish, install, and place in operation the power switching system in accordance with the contract documents and manufacturer's drawings and installation instructions. These specifications also describe requirements for the design, fabrication, and testing of the power switching system.

B. The automatic transfer switches and related work shall be provided as a complete and operable system, in full compliance with all requirements on the drawings and all specifications requirements. The drawings are diagrammatic and the specifications are performance-based, and the contractor shall provide all work required to comply with the drawings and specifications, even if not explicitly indicated or specified. The contractor shall be responsible for coordinating installation of the engine-generator system with all field conditions and the work of other trades. Minimum clearances and work required for compliance with NFPA 70 "National Electrical Code" and the manufacturer’s instructions shall be provided.

C. All equipment shall be new and of current production by an international, power system manufacturer of, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians. The power switching system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line. The power switching system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year. System manufacturer shall maintain a service center capable of providing training, parts, and emergency maintenance and repairs at the Project site with 2 hours maximum response time.

1.4 S/C - SUBMITTALS

A. S - General: Unless specified otherwise, the Supplier shall submit the following documentation with the RFP response to the Owner’s Representative. RFP responses without the specified documentation or missing documentation may be rejected by the Owner’s Representative, at the Owner’s Representative discretion. Submit and obtain approval of all product data, shop drawings, wiring diagrams, protective device studies, coordination drawings, certifications, and compliance certifications prior to release of equipment for fabrication.

B. S - Product data for products specified in this Section. Include data on features, performance, components, and ratings, including KW, KVA, starting KVA, voltage dip, transient reactance, sub transient reactance, and zero-sequence reactance. Include dimensioned outline plan and elevation drawings of engine generator set and other system components. Submit certified total harmonic current distortion ratings for voltage regulators.

C. S - Submit as a part of project closeout documentation O&M operation and maintenance data for system and components for inclusion in Operating and Maintenance Manual specified in Division 1 of the construction contract. Include all features and operating sequences, both automatic and manual. List all factory settings of relays and provide relay setting and calibration instructions. Include detailed operating instructions. Cover operation under both normal and abnormal conditions.

D. S - Shop Drawings: Shop drawings or published product data for each transfer switch, including dimensioned plans, sections, and elevations showing minimum clearances; conductor entry provisions; gutter space; installed features and devices; and materials lists.

E. S - Wiring Diagrams for System: Show power and control connections and distinguish between factory-installed and field-installed wiring.

F. Manufacturer's certificate of compliance to the referenced standards and tested short-circuit closing and withstand ratings applicable to the protective devices and current ratings used in this Project, as indicated and as specified in paragraph "Tested Fault Current Ratings."

G. S - Qualification Data for Manufacturer: Include capabilities and experience data required to demonstrate qualifications specified in Quality Assurance Article. Include list of five completed projects with equipment similar to the system specified herein, with project names and addresses and names of Engineers and Owners, plus other information specified.

H. C Field-Testing Organization Certificates: Signed by Contractor, certifying that the organization complies with the requirements specified in Quality Assurance below.

I. S - After completion of factory testing, submit factory test reports for units to be shipped for this Project showing evidence of compliance with specified requirements.

J. S/C - After completion of field testing, submit field test report as a record of tests specified in Part 3.

K. S/C – Coordination and installation/coordination layout drawings shall be submitted within 30 days of proposal acceptance.

1. The purpose of the submittals specified herein is not only to show compliance with the requirements, but is also for future identification, replacement, duplication, and servicing.

2. The work described in all submittals shall be carefully checked by the contractor and proposed equipment manufacturer for all clearances, including those required for maintenance and servicing, field conditions, maintenance of architectural conditions, and proper coordination. Each submittal shall include a certification by the contractor and

proposed equipment manufacturer that all related conditions have been checked and that no conflict exists. No submittal will be reviewed without such certification.

3. Based on equipment drawings and diagrams provided by the Supplier as a part of project submittals, the Contractor shall prepare complete coordination layout drawings and field wiring diagrams for the generator set equipment, automatic transfer switches, and related equipment. Layout drawings will verify equipment locations, conduit and wiring provisions, and space allocated for maintenance and service. Layout drawings will indicate code-required clearances and manufacturer-recommended clearances around all equipment..

L. S/C - Submittal Submission Schedule:

All drawings, etc., shall be submitted sufficiently in advance of field requirements to allow ample time for checking, and no claim for extension of contract time will be granted to Supplier or Contractor, by reason of his failure in this respect. All submittals shall be complete and shall contain all required and detailed information. Submittals with multiple parts shall be submitted as a complete package.

M. S - Compliance Certification:

Submit a complete copy of this specification section and all other related sections with each paragraph and subparagraph marked with either "compliance," "deviation," or "alternate." Submit copy of drawing equipment schedules and related drawing notes, marked in the same manner as specified above for specification paragraphs. All deviations and alternates to the specifications and drawings shall be fully described in attached documentation as to what the contractor and manufacturer propose to provide. Approval of deviations and will remain within the sole discretion of the Owner's Representative. If proposed deviations or alternates are disapproved, the contractor shall provide equipment and materials in full compliance with the specifications, at no additional cost and without schedule extension.

N. S - Certifications:

Seismic Design and Testing Certificate: Document compliance with all specification and applicable building code requirements for equipment seismic design and testing.

O. S – Proposed Settings:

As a part of submittals, indicate proposed ATS voltage/frequency/time delay settings in accordance with manufacturer recommendations and indicate where direction is needed from Owner's Representative on selected settings.

1.5 S/C - QUALITY ASSURANCE

A. Manufacturer Qualifications: Refer to requirements specified above in paragraph “System Description”.

B. Field-Testing Organization Qualifications: To qualify for acceptance, a testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct the indicated testing satisfactorily.

C. Comply with NFPA 70, "National Electrical Code."

D. Comply with NFPA 110, "Standard for Emergency and Standby Power Systems," for requirements for a Level 1 emergency power supply system.

E. Listing and labeling: Electrical equipment shall be listed and labeled by Underwriter's Laboratories (UL), or another nationally recognized testing laboratory (NRTL). All equipment, materials, and devices required to comply with referenced UL standards shall bear labeling from the NRTL to verify compliance. Comply with UL Standard 1008, "Automatic Transfer Switches".

The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

f. Comply with NEMA ICS 1, "General Standards for Industrial Control," ICS 2, "Industrial Control Devices, Controllers and Assemblies," and ICS 6, "Enclosures for Industrial Controls and Systems."

G. Single-Source Responsibility: Obtain engine generator system components from a single manufacturer with responsibility for entire system. Unit shall be a representative product built from components that have proven compatibility and reliability and are coordinated to operate as a unit as evidenced by records of prototype testing.

1.6 S/C - DELIVERY, STORAGE, AND HANDLING

Supplier shall deliver automatic transfer switches to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is made safe from such hazards. Supplier is responsible for transportation of equipment to the project site unloading area designated by the Owner's Representative. Contractor is responsible for unloading of all equipment and provisions for safe and protected storage at the project site until equipment is installed by the Contractor.

PART 2 PRODUCTS

2.1 S - MANUFACTURERS

A. Subject to compliance with this specification, automatic transfer switches shall be from one of the manufacturers listed below:

1. Kohler – Basis of Design

Alternate manufacturers from which the owner will accept proposals for consideration:

2. Caterpillar
3. Cummins
4. Generac

5. Asco
6. Russelectric

Note: Listing of a manufacturer above does not commit the Owner to accepting any proposals from a manufacturer listed. All proposals must include the submittal data listed in paragraph “Submittals” specified hereinbefore. Substitutions and additional alternate manufacturers shall not be permitted.

2.2 S - SYSTEM SERVICE CONDITIONS

A. Service Conditions: Engine generator system shall operate within the following service conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: Minus 4 degrees F to plus 158 degrees F.

2. Relative Humidity: 0 to 95 percent.

3. Altitude: 750 feet above sea level.

5. Installation Location: Refer to automatic transfer switch schedule.

2.2 S - AUTOMATIC TRANSFER SWITCHES (ATS's)

A. General: Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer. Provide two (2) Isolation bypass automatic transfer switches, of which one shall be a standard open transition mechanism, the other shall be a Gen to Gen control configuration and open transition mechanism configuration, as indicated on the automatic transfer switch schedule.

1. Comply with Level 1 equipment according to NFPA 110, "Standard for Emergency and Standby Power Systems."

2. Number of Poles and Current and Voltage Ratings: As indicated on the automatic transfer switch schedule included below in this specification section.

3. Units rated for 400 amps or less shall not have different current ratings for different classes or mixtures of loads, including 100 percent tungsten filament lamp or 100 percent inductive load.

4. Units rated for 600 amperes and larger have current ratings that apply to mixtures of loads including 30-percent-maximum tungsten filament lamp load.

B. Tested Fault-Current Ratings: Closing and withstand ratings shall be as indicated on the automatic transfer switch schedule, and shall be based on testing according to UL Standard 1008, conducted at full-rated system voltage and 20 percent power factor. Rate each product

for withstand duration time as follows when tested for rated short-circuit current correlated with the actual type of circuit protective device indicated for transfer switches for this Project:

1. Molded-Case Circuit Breakers, 150 Amperes or Smaller: 1.5 closing and withstand duration cycles.
2. Molded-Case Circuit Breakers, Larger than 150 Amperes: 3 closing and withstand duration cycles.
3. Power Circuit Breakers: 10 closing and withstand duration cycles.
4. Current-Limiting Fuses: 0.5 (nominal) closing and withstand duration cycles.

C. Switch Mechanism Construction

1. The transfer switch shall be electrically operated and mechanically held with double throw construction, and operated by a momentarily energized solenoid-driven mechanism.
2. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
3. The switch shall be positively locked and unaffected by momentarily outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
4. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
5. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 800 amperes and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
6. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, shall not be permitted. Overcurrent devices shall not be part of switch products. Transfer switches constructed with either automatic or non-automatic circuit breakers shall not be permitted. Transfer switches equipped with protective devices to interrupt fault currents shall not be permitted.
7. For two and three pole switches, where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.
8. For four pole switches with a switching neutral, where neutral conductors must be switched as shown on the plans, the contactor shall be provided with fully rated switched neutral transfer contacts.
9. Overlapping neutral contacts shall be provided where indicated or specified. The overlapping neutral transfer contacts shall not overlap for time duration greater than 100 milliseconds. A non-overlapping neutral transfer pole shall not be permitted where an overlapping neutral pole is indicated

D. Enclosure

1. The ATS shall have a NEMA 1 or NEMA 3R enclosure, as indicated on the automatic transfer switch schedule.
2. All standard door mounted switches and indicating LEDs shall be integrated into a flush-mounted, interface membrane or equivalent in the enclosure door for easy viewing &

replacement. The panel shall be capable of having a manual locking feature to allow the user to lockout all membrane mounted control switches to prevent unauthorized tampering. This cover shall be mounted with hinges and have a latch that may be padlocked. The membrane panel shall be suitable for mounting by others when furnished on open type units.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage surge withstand capability requirements when tested according to ANSI C37.90.1, IEEE Guide for Surge Withstand Capability (SWC) Tests. Components shall meet or exceed voltage impulse withstand test of NEMA ICS 1. Provide a Surge Protection Device (SPD) for protection of the normal source supply. The SPD shall be provided with replaceable cartridges to allow replacement of components without disconnecting the normal source supply. A 90dB audible alarm shall be provided as standard. A terminal block for remote contacts shall be provided. The SPD shall provide L-L, L-N, L-G, and N-G lines protection. LED status indicators shall be available on the face of the device to indicate operational state. The SPD device shall be listed to UL 1449, Edition 3.

H. Factory Wiring: Train and bundle factory wiring and identify consistently with shop drawings, either by color code or by numbered or lettered wire and cable tape markers at terminations.

1. Designated terminals accommodate field wiring.

2. Power Terminals Arrangement and Field Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.

3. Terminals: Pressure-type, suitable for copper or aluminum conductors of sizes indicated.

4. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Standard I/O Module. The standard I/O Module shall have two programmable inputs and six programmable outputs.

1. Inputs available: 2
   a. Contact Closure
   b. Current 5mA Max.
   c. Connection Type Terminal Strip
   d. Wire Size #14-24 AWG
   e. Max Distance 700 feet

2. Outputs available: 6
   a. Contact Type Form C (SPDT)
   b. Contact Rating 2A @ 30VDC, 500mA @ 125VAC
   c. Connection Type Terminal Strip
   d. Wire Size #14-24

J. External Battery Supply Module. The external battery shall energize the ATS controls using an external battery when no source power is available, allow extended engine start time delays, the use of any combination of accessory modules, connect to one or two batteries, 12 VDC

or 24 VDC, current draw, 140 mA @ 12 VDC, 86 mA @ 24 VDC, shall provide low external battery voltage indication to the transfer switch controller, and reverse-polarity protected.

2.3 S - AUTOMATIC TRANSFER SWITCH FEATURES

E. Test Switch: Simulates normal source failure.

F. Switch-Position Pilot Lights: Indicate source to which the load is connected.

G. Source-Available Indicating Lights: Supervise sources via the transfer switch normal and emergency source-sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

2. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

H. Transfer Override Switch: Overrides automatic retransfer control so the ATS will remain connected to the emergency power source regardless of the condition of the normal source. A pilot light indicates the override status.

I. Engine Starting Contacts: One isolated normally closed and 1 isolated normally open. Contacts shall be gold flashed or gold plated and rated 10 amperes at 32 V d.c. minimum.

J. Engine Shutdown Contacts: Time delay adjustable from 0 to 60 minutes; factory set at 5 minutes.

K. Time Delay Bypass Switch: Bypasses time delay functions.

L. Manual Return-To-Normal Switch.

M. Operator: A manual operator, conforming to the applicable provisions of UL 1008, shall be provided to permit manual operation of the ATS under either loaded or no-load conditions.

2.4 S - AUTOMATIC TRANSFER SWITCH CONTROLS

A Controls

1. Provide a four line, 20 character LCD display and keypad as an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and control through the communications interface port or USB. The following parameters shall only be adjustable via a password protected programming on the controller:
   a. Nominal line voltage and frequency
   b. Single or three phase sensing
   c. Operating parameter protection

d. Transfer operating mode configuration (Standard transition, Programmed transition, or Closed transition)

B Voltage and Frequency

1. Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities shown as % of nominal unless otherwise specified:

	Parameter	Dropout/Trip	Pickup/Reset
a			
b	Under voltage	75 to 98%	85 to 100%
c	Over voltage	106 to 135%	95 to 100% of trip
d	Under frequency	95 to 99%	80 to 95%
e	Over frequency	01 to 115%	105 to 120%
f	Voltage unbalance	5 to 20%	3 to 18%

2. Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 70°C.
3. An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
4. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad, remotely via the communications interface port or USB. As a part of submittals, indicate proposed settings in accordance with manufacturer recommendations and indicate where direction is needed from Owner's Representative on selected settings.
5. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be indicated on the LCD; the service required LED and the annunciation through the communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being disabled, only where approved in writing by the Owner's Representative.
6. The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition is a loss of phase and shall be considered a failed source.
7. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

C Time Delays

1. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 12 or 24 VDC power supply.
2. A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
3. A time delay shall be provided on re-transfer to normal. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
4. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

5. A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect and reconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal.
6. All time delays shall be adjustable in 1 second increments.
7. All time delays shall be adjustable by using the display and keypad, with a remote device connected to the communications interface port or USB. As a part of submittals, indicate proposed settings in accordance with manufacturer recommendations and indicate where direction is needed from Owner's Representative on selected settings.
8. Each time delay shall be identified and a dynamic countdown shall be shown on the display. Active time delays can be viewed with a remote device connected to the communications interface port or USB.

D Generator to Generator Transfer Switch Automatic Transfer Control: Provide where indicated on the automatic transfer switch schedule.

1. Along with standard controls for automatic transfer switch operation; the automatic transfer switch shall be designed for field programming to serve as a dual source generator to generator transfer switch. Programming shall include all necessary control functions to control and monitor the two generator sets as needed for automatic standby mode. Typical operation programming will designate one generator as the primary "lead" unit to respond to an outage signal from the "Utility-Generator" automatic transfer switch. Should the primary generator fail the secondary generator will be started and connected to the switch output terminals. Selection of either generator to be the primary "lead" generator shall be a programmable option. This switch shall include an external battery power supply connection for control power during utility power outages, which shall be extended to each generator's battery DC system for connection.

2.5 S - AUTOMATIC TRANSFER SWITCH SPECIAL REQUIREMENTS

Refer to Automatic Transfer Switch Schedule on the drawings. Where specified or indicated, provide the features specified below:

A. Bypass-Isolation Switch Mechanism.

B. Open Transition Transfer Switch.

C. Programmed Transition Transfer Switch.

D. Open Transition Transfer Switch.

D. Engine-Generator Exerciser: Solid-state programmable time switch starts engine-generator set and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiate exercise cycle at preset intervals adjustable from

7 to 30 days. Running periods shall be adjustable from 10 to 120 minutes. Factory-set periods are for 7 days and 20 minutes, respectively. Exerciser features include:

1. Exerciser transfer selector switch, which permits selection between exercise with and without load transfer.

2. Push button programming controls with digital display of settings.

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

E. Auxiliary Automatic Transfer Switch Position Contacts: Quantity as indicated.

E. Auxiliary Bypass - Isolation Switch Position Contacts: Quantity as indicated.

G. Load-Shedding Control Contacts: Quantity as indicated.

H. Fully Rated Solid Neutral.

J. Overlapping Neutral Transfer Contacts.

I. Selective Load Disconnect Control Contacts: Quantity and timing as indicated.

J. Digital Communications Interface.

K. In-Phase Monitor Control: Factory-installed and factory-wired internal in-phase monitor relay. The relay shall control transfer so it occurs when the 2 sources are synchronized in phase. The relay shall compare phase relationship and frequency difference between the normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if the transfer can be completed within 60 electrical degrees. In-phase transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage. In-phase monitor shall limit motor inrush currents to no more than normal starting currents.

L. Timed Transfer Midpoint Position Switch: Operator shall have a programmed neutral position arranged to provide a midpoint between the 2 working switch positions with an intentional, controlled, timed pause during transfer at the midpoint. The midpoint pause is adjustable from 0.5 to 30 seconds minimum, and factory set at 10 seconds, except as indicated otherwise. Time delay shall occur for both transfer directions.

2.6 S - MANUAL TRANSFER SWITCHES (MTS’s)

A. Manual transfer switches shall have same construction and features specified for automatic transfer switches, but without controls and switch operator for automatic operation. MTS’s shall have a manual operation handle.

2.7 S - FINISHES

A. Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

2.8 S - SOURCE QUALITY CONTROL

A. Factory test components, assembled switches, and associated equipment to ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for conformance with specified requirements. Perform dielectric strength test conforming to NEMA ICS 1.

2.14 S/C - SEISMIC REQUIREMENTS

A. Internal and external supports for components, supports, and fastenings for equipment, piping, and wiring shall be designed to withstand static or anticipated seismic forces, or both, in all directions. The generator set shall be IBC Certified as meeting the required maximum seismic design acceleration level per the International Building Code in effect at the time of issuance of this specification for the specific location of the generator installation site. The generator shall be analyzed or shake tested by a third party, accompanied by a Certificate of Compliance, and include a seismic label on the generator set (per Section 1702 of the IBC Code). Seismic certified generators shall be installed per the specific seismic instructions provided by the manufacturer.

2.15 S/C – AUTOMATIC TRANSFER SWITCH SCHEDULE

A. Automatic Transfer Switch Schedule: Comply with the ratings and other requirements indicated below.

1. Basis of Design: Kohler Standard Transition KCS-DMVA-0400S

AUTOMATIC TRANSFER SWITCH SCHEDULE						FAULT CURRENT RATING (A)	REMARKS/ACCESSORIES
DESIG	RATING	NEUTRAL	ENCLOSURE	LOCATION	CONFIGURATION	ANY BREAKER TYPE W/INST TRIP)	
ATS "A"	480V, 3PH 4P, 400A	SWITCHED	NEMA 1	INTERIOR	GENERATOR-UTILITY	35,000	
ATS "B"	480V, 3PH 4P, 400A	SWITCHED	NEMA 1	INTERIOR	GENERATOR-GENERATOR	35,000	GEN-GEN AUTO XFER CONTROL; EXTERNAL 24 VDC PWR SUPPLY FROM BOTH GEN'S

2.16 S - WARRANTY

1. Warranty and Service: The automatic transfer switches shall include a standard warranty covering one (1) year to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup. The automatic transfer switch manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 3 EXECUTION

3.1 C - INSTALLATION

A. Mounting of Transfer Switches: Level and anchor the unit to the floor or wall as indicated.

B. Annunciator Panel Mounting: Mount flush in wall except as indicated.

C. Identify components according to applicable codes and manufacturer recommendations.

3.2 C - CONNECTIONS

A. Tighten factory-made connections, including connectors, terminals, bus joints, mountings, and grounding. Tighten field-connected connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque tightening values. When manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and 486B.

3.3 C - GROUNDING

A. Make equipment-grounding connections for transfer switch units as indicated and as required by the NEC.

3.4 S/C - FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise field tests.

B. Preliminary Tests: Perform electrical tests as recommended by the manufacturer and as follows:

1. Measure phase-to-phase and phase-to-ground insulation resistance levels with insulation resistance tester, including external annunciator and control circuits. Use test voltages and procedure recommended by the manufacturer. Meet manufacturer's specified minimum resistance.

2. Check for electrical continuity of circuits and for short circuits.

C. Field Tests: Give 7-day advance notice of the tests and perform tests in presence of owner's representative.

D. Coordinate testing and training with testing/training of generator plant and run them concurrently.

E. Tests: Provide all testing recommended by the manufacturer, and additional testing as follows:

1. Contact Resistance Test: Measure resistance of power contacts for ATSs. Resolve values in excess of 500 micro-ohms and differences between adjacent poles exceeding 50 percent.

2. Operational Tests: Demonstrate interlock, sequence, and operational function for each switch at least 3 times.

a. Simulate power failures of normal source to ATSs and of emergency source with normal source available.
b. Simulate low phase-to-ground voltage for each phase of normal source of ATSs.
c. Verify time-delay settings and pick-up and drop-out voltages.

F. Test Failures: Correct deficiencies identified by tests and prepare for retest. Verify that equipment meets the specified requirements.

G. Commissioning: The Owner will be retaining the services of an independent commissioning agent to participate in additional commissioning documentation and testing. The Supplier shall provide the services of the manufacturer's factory-trained distributor service representative for two 8 hour days for commissioning testing. The Contractor shall provide the services of licensed electrician for two 8 hour days for commissioning testing. Commissioning testing procedures will be provided to the Supplier and Contractor after review and approval of project submittals.

H. Reports: Maintain a written record of observations and tests. Report defective materials and workmanship and retest corrected items. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.5 S/C - DEMONSTRATION

A. Training: Supplier shall provide the services of a factory-authorized service representative to demonstrate adjustment, operation, and maintenance of the system and to train Owner's personnel for a minimum of 8 hours total.

D. Schedule training at Owner’s convenience with at least 14-day advance written notice.

END OF SECTION