Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for automatic load transfer equipment which can monitor voltage on all phases of normal power supply, initiate cranking of standby generator unit, transfer loads and shut down standby unit.

1.2 RELATED SECTIONS

.1 Section 01 11 00 - General Requirements.

.2 Section 26 05 00 - Common Work Results for Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN3-C13-[M83(R1998)], Instrument Transformers.

.2 CSA C22.2No.5-[02], Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

.3 CSA C22.2No.178-[1978(R2001)], Automatic Transfer Switches.

.2 National Electrical Manufacturers Association (NEMA)

.1 ANSI/NEMA ICS 2-[2000], Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

1.4 SYSTEM DESCRIPTION

.1 Automatic closed transition transfer equipment with isolation bypass:

.1 Monitor voltage on phases of normal power supply.

.2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below preset adjustable limits for adjustable period of time.

.3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.

.4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.

.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

.6 The new ATS unit shall have foot print similar to the existing unit in order to accommodate the unit in the same location.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Include:

- .1 Make, model and type.
- .2 Load classification:
  - .1 Tungsten lamp load.
  - .2 Ballast lamp load.
  - .3 Motor load
  - .4 VFD Loads
  - .5 UPS Loads
  - .6 Restricted use: resistance and general loads, 0.8pf or higher kW.
- .3 Single line diagram showing controls and relays.
- .4 Description of equipment operation including:
  - .1 Automatic closed transition transfer equipment with isolation bypass.
  - .2 Test control.
  - .3 Manual control.
  - .4 Automatic shutdown.

1.6 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for automatic load transfer equipment for incorporation into manuals.

.2 Detailed instructions to permit effective operation, maintenance and repair.

.3 Technical data:

- .1 Schematic diagram of components, controls and relays.
- .2 Illustrated parts lists with parts catalogue numbers.
- .3 Certified copy of factory test results.

Part 2 Products

2.1 MATERIALS

.1 Instrument transformers: to CAN3-C13.

.2 Contactors: to ANSI/NEMA ICS2.

2.2 CONTACTOR TYPE TRANSFER EQUIPMENT

.1 Contact Type Transfer Equipment: to CSA C22.2No.178.

.2 Two- 3 phase contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, motor operated with CSA enclosure.

.3 Rated: 480/277Vac, 60Hz, 600 A, 4 wire.

.4 Main contacts: silver surfaced, protected by arc disruption means.

.5 Switch and relay contacts, coils, spring and control elements accessible for inspection and maintenance from front of panel without removal of switch panel or disconnection of drive linkages and power conductors.

.6 Auxiliary contact: gold plated, to initiate emergency generator start-up on failure of normal power.

.7 Fault withstand rating: Minimum 35 kA symmetrical.

.8 Lever to operate switch manually when switch is isolated.

.9 Overlapping neutral contacts on contactor type transfer equipment.

2.3 CONTROLS

.1 Microprocessor Control

.1 The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.

.2 A single controller shall provide twelve selectable nominal voltages for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to ± 1% of nominal voltage. Frequency sensing shall be accurate to ± 0.2%. The panel shall be capable of operating over a temperature range of -20 to +60 degrees C and storage from -55 to +85 degrees C.

.2 Control transformers: dry type with 120V secondary to isolate control circuits from:

.1 Normal power supply.

.2 Emergency power supply.

.3 Relays: continuous duty, industrial control type, with wiping action contacts rated 10 A minimum:

.1 Voltage sensing: 3 phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2V minimum undervoltage and over voltage protection.

.4 Automatic Transfer Switch to include Pre-Transfer and Post-Transfer signal features.

2.4 TRANSFER SWITCH

.1 The transfer switch shall be electrically operated and mechanically held. The electrical operators shall be a momentarily energized, solenoid mechanism. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable.

.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 momentary 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 800 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 amps 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, are not acceptable.

.7 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.

2.5 Bypass-Isolation Switch

.1 A two-way bypass-isolation switch shall provide manual bypass of the load to either source and permit isolation of the automatic transfer switch from all source and load power conductors. All main contacts shall be manually driven.

.2 Power interconnections shall be silver-plated copper bus bar. The only field installed power connections shall be at the service and load terminals of the

bypass-isolation switch. All control inter-wiring shall be provided with disconnect plugs.

.3 Separate bypass and isolation handles shall be utilized to provide clear distinction between the functions. Handles shall be permanently affixed and operable without opening the enclosure door. Designs requiring insertion of loose operating handles or opening of the enclosure door to operate are not acceptable.

.4 Bypass to the load-carrying source shall be accomplished with no interruption of power to the load (make before break contacts). Designs which disconnect the load when bypassing are not acceptable. The bypass handle shall have three operating modes: "Bypass to Normal," "Automatic," and "Bypass to Emergency." The operating speed of the bypass contacts shall be the same as the associated transfer switch and shall be independent of the speed at which the manual handle is operated. In the "Automatic" mode, the bypass contacts shall be out of the power circuit so that they will not be subjected to fault currents to which the system may be subjected.

.5 The isolation handle shall provide three operating modes: "Closed," "Test," and "Open." The "Test" mode shall permit testing of the entire emergency power system, including the automatic transfer switches with no interruption of power to the load. The "Open" mode shall completely isolate the automatic transfer switch from all source and load power conductors. When in the "Open" mode, it shall be possible to completely withdraw the automatic transfer switch for inspection or maintenance to conform to code requirements without removal of power conductors or the use of any tools.

.6 When the isolation switch is in the "Test" or "Open" mode, the bypass switch shall function as a manual transfer switch.

.7 Designs requiring operation of key interlocks for bypass isolation or ATSs which cannot be completely withdrawn when isolated are not acceptable.

2.6 Voltage, Frequency and Phase Rotation Sensing

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

Parameter	Dropout / Trip	Pickup / Reset
Undervoltage	70 to 98%	85 to 100%
Overvoltage	102 to 115%	2% below trip
Underfrequency	85 to 98%	90 to 100%
Overfrequency	102 to 110%	2% below trip
Voltage unbalance	5 to 20%	1% below dropout

.2 Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 60°C.

.3 Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

.4 The controller shall be capable (when activated by the keypad or through the serial port) 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 CBA).

.5 Source status screens shall be provided for both normal and emergency to provide digital readout of voltage on all three phases, frequency and phase rotation.

.6 The controller shall include a user selectable algorithm to prevent repeated transfer cycling to a source on an installation which experiences primary side, single phase failures on a Grounded Wye – Grounded Wye transformer which regenerates voltage when unloaded. The algorithm shall also inhibit retransfer to the normal (utility) source upon detection of a single phasing condition until a dedicated timer expires, the alternate source fails, or the normal source fails completely and is restored during this time delay period. The time delays associated with this feature shall be adjustable by the user through the controller keypad and LCD.

2.7 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 24 VDC power supply.

.2 A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.

.3 An adjustable time delay of 0 to 6 seconds to override momentary emergency source outage to delay all retransfer signals during initial loading of engine generator set.

.4 Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. 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.

.5 A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

.6 A time delay activated output signal shall also be provided to drive an optional external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minute time delay in any of the following modes:

.1 Prior to transfer only.
.2 Prior to and after transfer.
.3 Normal to emergency only.
.4 Emergency to normal only.
.5 Normal to emergency and emergency to normal.
.6 All transfer conditions or only when both sources are available.

.7 The controller shall also include the following built-in time delays for Service Entrance Closed Transition Transfer with Bypass-Isolation operation:

.1 1 to 5 minute time delay on failure to synchronize normal and emergency sources prior to closed transition transfer.
.2 0.1 to 9.99 second time delay on an extended parallel condition of both power sources during closed transition operation.

.8 All time delays shall be adjustable in 1 second increments, except the extended parallel time, which shall be adjustable in .01 second increments.

.9 All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port. The time delay value displayed on the LCD or remote device shall be the remaining time until the next event occurs.

2.8 ENCLOSURE

.1 The ATS shall be furnished in a Type 1 enclosure unless otherwise shown on the plans.

.2 All standard and optional door-mounted switches and pilot lights shall be 16-mm industrial grade type or equivalent for easy viewing & replacement. Door controls shall be provided on a separate removable plate, which can be supplied loose for open type units.

.3 A pressure disconnect link shall be provided to disconnect the normal source neutral connection from the emergency and load neutral connections for 4-mm wire applications. A ground bus shall be provided for connection of the grounding conductor to the grounding electrode. A pressure disconnect link for the neutral to ground bonding jumper shall be provided to connect the normal neutral connection to the ground bus.

2.9 ACCESSORIES

.1 Controller Display and Keypad: A four line, 20 character LCD display and keypad shall be 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 limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller:

- .1 Nominal line voltage and frequency
- .2 Single or three phase sensing
- .3 Operating parameter protection
- .4 Transfer operating mode configuration (Open transition, Closed transition or Delayed transition)

All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

2.10 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results – Electrical.

.2 Control panel:

- .1 For selector switch and manual switch: size 5 nameplates.
- .2 For meters, indicating lights, minor controls: size 3 nameplates.

2.11 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested.

.2 Tests:

- .1 Operate equipment both mechanically and electrically to ensure proper performance.
- .2 Check selector switch, in modes of operation Test, Auto, Manual, Engine Start and record results.
- .3 Check voltage sensing and time delay relay settings.
- .4 Check:
  - .1 Automatic starting and transfer of load on failure of normal power.
  - .2 Retransfer of load when normal power supply resumed.
  - .3 Automatic shutdown.
  - .4 In-phase monitor operation.

Part 3 Execution

3.1 INSTALLATION

.1 Prior to demolishing the existing ATS unit, install the new ATS unit with all required conductors and conduits.

.2 Propose a plan to the facility management for switchover from the existing ATS unit to the new ATS unit with minimum downtime. Specify approximate downtime as part of the plan. Suggested Switchover Sequence:

- .1 Run the Generator to supply power to the Emergency Panel CDP E4A via the existing ATS. Disconnect normal power from the existing ATS, and provide main power to the new ATS.
- .2 Connect the load side of the new ATS to the Emergency Panel CDP E4A and run the Emergency panel on normal power now.
- .3 Disconnect the Generator for the existing ATS and connect the emergency terminal of the new ATS and all control wiring to the Generator.
- .4 Commission the new ATS.

.3 It is the contractor’s responsibility to take into consideration worker safety and downtime when planning the switchover sequence.

.4 Check for Correct Phase Rotation with Respect to the Utility.

.5 Install Equipment as per Manufacturer’s Instructions.

.6 Check relay, solid state monitors and adjust as required.

.7 Install and connect battery and remote alarms.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical

.2 Energize transfer equipment from normal power supply.

.3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.

END OF SECTION