

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canada Green Building Council (CaGBC)
.1 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations. |
| | .2 | CSA International
.1 CSA C22.2 No.178.1, Automatic Transfer Switches. |
| <u>1.2 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Submit in accordance with Section 26 05 00 - Common Work Results for Electrical. |
| | .2 | Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for transfer switch and include product characteristics, performance criteria, physical size, finish and limitations. |
| | .3 | Shop Drawings:
.1 Indicate on drawings:
.1 Make, model and type.
.2 Single line diagram showing controls and relays.
.3 Description of equipment operation including:
.1 Automatic starting and transfer to standby unit and back to normal power.
.2 Test control.
.3 Manual control.
.4 Automatic shutdown.
.5 By-pass feature.
.6 Transfer inhibitor. |
| <u>1.3 CLOSEOUT SUBMITTALS</u> | .1 | Operation and Maintenance Data: submit operation and maintenance data for transfer switches for incorporation into manual. |
| | .2 | Detailed instructions to permit effective operation, maintenance and repair. |
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1.3 CLOSEOUT SUBMITTALS (Cont'd)	.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.
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1.4 DELIVERY, STORAGE AND HANDLING	.1	Deliver, store and handle materials in accordance with manufacturer's written instructions and to Section 26 05 00.
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PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION	.1	Automatic load transfer equipment to: .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 Provide transfer inhibitor to prevent transfer in the event of a fault on the normal power breaker. .4 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits. .5 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. .6 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.
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2.2 BYPASS/ ISOLATION SWITCH	.1	Comply with requirements for Level 1 equipment according to NFPA 110.
	.2	Description: Transfer switch shall be provided with a manually-operated bypass switch arranged to select and connect either

2.2 BYPASS/
ISOLATION SWITCH
(Cont'd)

- .2 Description: (Cont'd)
- source of power directly to load, isolating transfer switch from load and both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:
- .1 The bypass switch shall be enclosed in the same cabinet as the automatic transfer switch, and UL-listed as an assembled product.
 - .2 The bypass isolation switch shall provide a means or manually bypassing the transfer switch from either source (Normal or Emergency) to the load while under load if necessary, and to isolate the transfer switch from both sources for maintenance or repair without a power interruption or disturbance.
 - .1 Designs that bypass to only one source are not acceptable under this specification.
 - .3 The bypass switch shall be operable without the use of tools, and shall include the ability to isolate the automatic switch mechanism without the use of tools and without opening the exterior cabinet door(s).
 - .4 Operability: Switch shall be constructed so load bypass and transfer-switch isolation can be performed by one person in no more than two operations, in 15 seconds or less.
 - .5 Bypass isolation switch equipment shall be UL listed per Standard 1008 and CSA approved, with continuous current rating, voltage, and frequency ratings, and withstand and closing ratings equal to the transfer switch ratings at the specified conditions of ambient temperature, humidity, and altitude.
 - .6 The bypass isolation and transfer switches shall be mechanically held in each position. Switching mechanisms shall be break-before-make on all poles, including the neutral. The switch mechanism shall be an over-center toggle device which provides stored energy contact operation during both opening and closing. The speed of contact operation shall be independent of the force applied to the operating handles, which permit manual operation under load.
 - .7 Provide means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch

2.2 BYPASS/
ISOLATION SWITCH
(Cont'd)

- .2 Description: (Cont'd)
- .7 (Cont'd)
while isolated. While isolated, interlocks shall prevent transfer-switch operation, except for testing or maintenance.
- .8 Bypass switch shall be a fully-rated, manually-operated switch, rated for the same loads as the automatic transfer switch. Bypass switch shall provide bypass to either normal or emergency source by use of a door mounted, keyed source selector switch and a permanently mounted external operating handle. Equipment shall provide manual bypass without disturbance of the power supply to the load.
- .1 Equipment requiring load isolation before bypass is not acceptable for use on this Project.
- .9 Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts of main power conductors.
- .10 Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.
- .11 Positive mechanical interlocks shall prevent all possible source-to-source interconnections via the bypass switch. The interlock system shall assure a properly sequenced, mechanical guided bypass and isolation action.
- .1 Designs which depend on electrical interlocks to prevent source to source interconnections, or which intentionally interconnect to the sources via the bypass switch are not acceptable.
- .12 The equipment shall utilize automatic, mechanical stops to prevent manually bypassing to a dead source.
- .13 A drawout isolation mechanism shall provide closed-door isolation of the transfer switch. The isolation mechanism shall be interlocked so that either the transfer switch must be bypassed or the transfer switch must be open before the mechanism will permit isolation of the transfer switch. Drawout arrangement must provide physical separation from live parts and accessibility for testing and maintenance operations.

2.2 BYPASS/
ISOLATION SWITCH
(Cont'd)

- .2 Description: (Cont'd)
- .14 The isolation mechanism shall provide for three-position operation: Connected, Test, and Isolated. In the Connected position, isolation contacts shall be fully engaged and closed, with the transfer switch control cable connected. In the Test position, isolation contacts shall be open and the transfer switch control cable connected. The Test position shall allow operational testing of transfer switches and controls without power disruption to the load. In the Isolated position, the transfer switch and control shall be completely isolated from all power sources. In the Isolated position, the transfer switch shall be capable of being withdrawn from the cabinet.
- .15 The bypass and isolation process for the automatic transfer switch shall be capable of being fully accomplished without opening the cabinet door.
- .16 Interconnection of bypass/isolation switch with automatic transfer switch shall consist of factory-installed copper bus bars., plated at connection points and braced for the indicated available short-circuit current.
- .17 Note the size and access requirements for the transfer switch with bypass isolation and provide equipment that will fit into the space allowed as well as complying with code-specified access requirements.
- .18 Manufacturer's standard legend for control labels and instructions.
- .3 Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches:
Factory-installed copper bus bars, plated at connection points and braced for the indicated available short-circuit current.

2.3 REMOTE
ANNUNCIATOR SYSTEM

- .1 Functional Description: remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:
- .1 Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
- .2 Switch position.
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- 2.3 REMOTE ANNUNCIATOR SYSTEM
(Cont'd)
- .1 (Cont'd)
 - .3 Switch in test mode.
 - .4 Failure of communication link.
 - .2 Annunciator Panel: LED-lamp type with audible signal and silencing switch.
 - .1 Indicating Lights: grouped for each transfer switch monitored.
 - .2 Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
 - .3 Switch in test mode.
 - .4 Lamp Test: Push-to-test or lamp-test switch on front panel.
 - .3 Malfunction of annunciator or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation.
 - .4 Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation. The remote annunciation system shall not prevent transfer to the alternate source when the primary power source fails, nor prevent return to the primary source if the alternate source fails.
- 2.4 CONTACTOR TYPE TRANSFER EQUIPMENT
- .1 Contact Type Transfer Equipment: to CSA C22.2 No.178.1.
 - .2 Two 4 pole contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, solenoid operated, with CSA enclosure.
 - .3 Rated: 600 V, 60Hz, 400 A. 4 wire, solid neutral.
 - .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
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- 2.4 CONTACTOR TYPE .5 (Cont'd)
TRANSFER EQUIPMENT
(Cont'd)
- .6 Auxiliary contact: silver plated, to initiate emergency generator start-up on failure of normal power.
 - .7 Fault withstand rating: 22 kA.
 - .8 Neutral bar, solid rated: 400 A.
- 2.5 CONTROLS
- .1 Microprocessor based control with digital display. Solid state, accurate to +/- 2%, operating temperature range of -40 + 60°C.
 - .1 Test position - normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.
 - .2 Auto position - normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.
 - .3 Resistance to damage by voltage transients, meet or exceed requirements of IEEE CG2.41
 - .2 Control transformers: dry type with 120 V 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, 2 V minimum undervoltage and over voltage protection.
 - .2 Time delay: normal power to standby, adjustable solid state, 20 s to 10 minutes.
 - .3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 3 to 20 s delay.
 - .4 Time delay on retransfer from standby to normal power, adjustable 20 s to 10 minutes.
 - .5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer
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- 2.5 CONTROLS
(Cont'd)
- .3 Relays: (Cont'd)
.5 (Cont'd)
to normal power, adjustable solid state, 20 s
intervals to 10 minutes.
- 2.6 ACCESSORIES
- .1 Ensure pilot lights indicate power
availability normal and standby, switch
position, green for normal, red for standby,
mounted in panel.
- .2 Plant exerciser: 168 hours timer to start
standby unit once each week for selected
interval but does not transfer load from
normal supply. Timer adjustable 0-168 hours in
15 minute intervals.
- .3 Auxiliary relay to provide N.O. and N.C.
contacts for remote alarms.
- 2.7 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.
- 2.8 ACCEPTABLE
PROJECTS
- .1 Only for selected generator assembly
manufacturer.
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PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Locate, install and connect transfer equipment, as indicated.
 - .2 Check relays and adjust as required to ensure correct operation.
 - .3 Install and connect battery.
- 3.2 FIELD QUALITY CONTROL
- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for 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.
 - .4 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.