EXIT LIGHTS

1. GENERAL

1.1 Product Data

.1 Submit duct data in accordance with Section 16010 – Electrical General Requirements.

2. PRODUCTS

2.1 Standard Units

.1 Housing: cold rolled steel minimum 1.0 mm thick, satin white enamel finish.

.2 Face and back plates: die formed cold rolled steel

.3 Lamps: LED-2W 120 V.

.4 Operation: designed for 25 years of continuous operation without relamping.

.5 Letters: 150 mm high x 19 mm, with 13 mm thick stroke, red on white reading EXIT.

.6 Face plate to remain captive for relamping.

.7 Universal mounting.

3. EXECUTION

3.1 Installation

.1 Install exit lights.

.2 Connect fixtures to exit light circuits.

.3 Ensure that exit light circuit breaker is locked in on position.

END OF SECTION

UNIT EQUIPMENT FOR EMERGENCY LIGHTING

1. GENERAL

1.1 Work Included

.1 Supply emergency lighting units complete with all accessories.

1.2 Special Codes

.1 Canadian Electric Code, Part 1, Section 46 "Emergency Systems, Unit Equipment and Exit Signs".

.2 CSA Standard C22.2 No. 141 "Unit Equipment for Emergency Lighting".

.3 Building Code

1.3 Product Data

.1 Submit product data in accordance with Section 16010 – Electrical General Requirements.

.2 Data to indicate system components, mounting method, source of power and special attachments.

1.4 Warranty

.1 For batteries, the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 120 months, with a no-charge replacement during the first 5 years and a pro-rate charge on the second 5 years.

2. PRODUCTS

2.1 General

.1 Supply and install battery power emergency lighting where shown on the drawings. Lights are to switch "ON" automatically in the event of failure of normal power, and "OFF" on restoration of power. The batteries shall be automatically recharged from a 120 VAC supply.

2.2 Equipment

.1 Supply voltage: 120 V, ac.

.2 Output voltage: 12 V dc.

.3 Operating time: 60 min.

.4 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.5 Solid state transfer circuit.

.6 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.7 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.

.8 Lamp heads: integral on unit and remote as indicated on drawing, 345° horizontal and 180° vertical adjustment. Lamp type: tungsten, 9 W, minimum .

.9 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.10 Auxiliary equipment:

.1 Test switch

.2 Time delay relay

.3 Battery disconnect device

.4 output terminal blocks inside cabinet.

.11 Standard of Acceptance: Aimlight EBST Series.

2.3 Remote Heads

.1 Remote heads to be connected to the battery unit.

2.4 Line Connection

.1 Each battery unit shall be equipped with AC line cord and plug.

2.5 Batteries

.1 Unless specifically indicated provide batteries of sufficient watt-hour capacity to power the loads connected to each individual unit for 60 minutes, 12 volt, long life, maintenance free, sealed lead acid batteries, contained within the units.

2.6 Wiring of Remote Heads

.1 Conduit: type, to Section 16111 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Conductors: RW90 type to Section 16122 - Wires and Cables 0-1000 V, sized in accordance with manufacturer's recommendations.

3. EXECUTION

3.1 Installation

.1 Mount battery units with the bottom of the enclosure not less than 2.2 m above the floor, where practicable.

.2 Install duplex receptacle adjacent to unit and connect to 1Ø, 120V unswitched area lighting circuit.

.3 Where applicable wire from unit to third (DC) lamp in exit lights.

.4 Wiring from units to remote heads and/or exit lights shall be sized to prevent voltage drop of more than 5%.

.5 All emergency heads shall be properly aimed.

END OF SECTION

LIGHTING CONTROL EQUIPMENT – PHOTOELECTRIC

1. GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 16010 – Electrical General Requirements.

2. PRODUCTS

2.1 Photoelectric Lighting Control

.1 Exterior wall mounting.

.2 Capable of switching lighting as indicated on drawings.

.3 Voltage variation: plus or minus 10%.

.4 Temperature range: minus 40°C to plus 40°C.

.5 Rated for 5000 operations.

.6 Options:

- .1 Fail-safe circuit completed when relay de-energized
- .2 Twist-lock type receptacle
- .3 Terminal strip.

.7 Switching time delay of 30 s.

.8 Wall mounting bracket.

.9 Colour coded leads: size 10 AWG, 460 mm long.

3. EXECUTION

3.1 Installation

.1 Install photoelectric controls in accordance with manufacturer's instructions.

.2 Connect to exterior lighting contactor.

.3 Test operation of photocell.

END OF SECTION

POWER GENERATION – DIESEL

1. GENERAL

1.1 Related Work

.1 Cast-In-Place Concrete – installation of anchor services, setting templates: Division 03

.2 Cast-In-Place Concrete – Concrete Pad: Division 03

.3 Fuel System: Division 15

.4 Ventilation System: Division 15

.5 Exhaust System: Division 15

1.2 Description of System

.1 Generation system consists of:

- .1 Engine
- .2 Engine/alternator common base plate
- .3 Free-standing generator control switchboard
- .4 Double walled shell and tube heat exchanger
- .5 Battery charger and battery
- .6 Fuel day tank system and accessories
- .7 Cooling air ventilation system accessories
- .8 Engine exhaust silencer, flex actions and accessories
- .9 Alternator output circuit breaker in common enclosure, mount with control panel
- .10 Vibration isolators and seismic restraints
- .11 Factory testing
- .12 Site delivery, installation, and connections
- .13 Site commissioning and demonstration
- .14 Generator.

.2 Generator set and automatic transfer switch system to be designed for automatic emergency standby power.

.3 Generator set to include automatic shutdown and alarm indication for:

.1 Low oil pressure

.2 High coolant temperature

.3 Overspeed

.4 Over-crank

.5 Emergency stop.

.4 Generator set to include warning systems and indication for:

.1 Low oil pressure

.2 Low coolant temperature

.3 Low battery voltage

.4 Generator output breaker open

.5 Selector switch "not in automatic" position

.6 Coolant temperature rising.

1.3 Standards

.1 Canadian electrical code and territorial and local amendments.

.2 National building code.

.3 Local building code.

.4 NEMA Motor and Generator Standards.

.5 CSA Standard C282 – Emergency Electrical Power Supply in Building.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 16010 – Electrical General Requirements.

.2 Production shall not be started until all applicable shop drawings have been submitted to the Consultant for review.

.3 Incomplete shop drawing submissions will be returned without review. Only shop drawings for specific equipment being supplied will be accepted. Generic or standard catalogue data is not acceptable.

.4 Shop drawings to include:

.1 Schematic power and control diagrams showing generator, voltage regulator, metering, battery, battery charger, governor, and all engine/generator protection and controls. Indicate all field connection requirements.

.2 Make and model of engine, generator, governor, voltage regulator, battery charger, battery, exhaust silencer, block heater/thermostat, vibration isolators, control devices, and power components, complete with technical and performance data.

.3 Confirmation that the generator set will comply with 100% shop load performance requirements.

.4 Dimensioned drawings for alternator, engine, control switchboard, and all accessories.

.5 Indication of all anchoring/mounting locations, and all power/control connection locations.

.6 Confirmation that required engine power at 110% rated load condition, 0.8 PF, does not exceed the engine manufacturer's recommended stand by power rating.

.7 Manufacturer's published stand by power output curves and fuel consumption curves.

.8 Description of set operation including:

.1 Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit pressures rated voltage and frequency.

.2 Automatic shutdown and alarm on:

.1 Over-cranking

.2 Overspeed

.3 High engine temperature

.4 Low lube oil pressure

.5 Short circuit

.6 Alternator over voltage

.7 Lube oil high temperature.

.3 Over temperature on alternator.

.4 Manual remote emergency stop.

1.5 Operation and Maintenance Data

.1 Provide operation and maintenance data for diesel generator for incorporation into manual specified in Section 16010 – Electrical General Requirements.

.2 Include in operation and maintenance manual instructions for particular unit supplied and not general description of units manufactured by supplier, and:

.1 Operation and maintenance instructions to permit effective operation, maintenance, and repair for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, battery, fuel system, generator room, ventilation system, exhaust system, and accessories.

.2 Technical data:

.1 Illustrated parts list with parts catalogue numbers

.2 Schematic diagram of electrical controls

.3 Flow diagrams for:

.1 Fuel system

.2 Lubricating system

.3 Cooling system

.4 Certified copy of factory test results

.5 Maintenance and overhaul instructions and schedules

.6 Precise details for adjustment and setting of time delay relays or sensing controls which require on-site adjustment.

.3 Certified copy of factory test results.

.4 Copy of guarantee.

.5 Complete set of as-built physical, schematic, and wiring diagrams and complete installation instructions.

1.6 Maintenance Materials

.1 Provide maintenance materials in accordance with Division 01.

.2 Include:

.1 2 Fuel filter replacement elements

.2 1 Lube oil filter replacement elements

.3 1 Air cleaner filter elements

.4 1 Sets of fuses for control panel

.5 1 Of each type of indicating lamps

.6 1 Set of 'fan' belts

.7 1 Set of complete tools for routine servicing.

1.7 Source Quality Control

.1 Factory test generator set including engine, alternator, control panel, transfer switch, and accessories.

.2 The generator set and accessories are to be tested and manufactured in accordance with the manufacturer's quality assurance program. The programs shall comply with the intent, or CSA CAN3-Z299.3, or ISO 9001. Provide a copy of the manufacturer's quality assurance procedures manual if requested by the Consultant.

.3 Test procedure:

.1 Prepare blank forms and check sheet with spaces to record data. At top of first sheet record:

1 Date and location

.2 Generator set serial number

.3 Engine make, model, and serial number

.4 Alternator make, model, and serial number

.5 Voltage regulator make and model

.6 Rating of generator set, kW, kVA, volts, amps, RPM, Hz.

.2 Mark check sheet and record data on forms in duplicate as test proceeds.

.3 Provide reactive type load bank and related controls to allow testing, including 100% step loads. Provide all necessary instrumentation and recording equipment.

.4 Indicate name of test operator.

.4 Tests

.1 Perform functional and load tests to verify conformance with specifications, codes, and performance requirements.

.2 Tests are to include:

.1 Automatic shutdown devices and trouble alarms. Tests to include actual out-of-limits operation with protective devices in their installed and in-service condition to prove sensor operation within manufacturer's recommended limits. Jumper testing of sensors or remote simulation testing to prove shutdowns are not permissible.

.2 Automatic start-up, transfer to load, transfer back to normal power, cool down, and shutdown.

.3 Demonstrate the battery reverts to high rate charge after cranking.

1.8 Warranty

.1 For the diesel engine driven generator set, the 12 month warranty period prescribed in the General Conditions is extended to 60 month or 1500 operating hours, whichever occurs first.

1.9 Delivery

.1 Store generator set and accessories in an indoor, dry, heated location until delivered to the site.

.2 Coordinate site delivery so that equipment is off-loaded and immediately placed in a dry indoor location.

.3 Coordinate lifting, handling, and placing requirements of all items.

.4 Tests:

.1 With 100% rated load, operate set for 8 h, taking readings at 20 min. intervals, and record the following:

.1 Time of reading

.2 Running time

.3 Ambient temperature in °C

.4 Lube oil pressure in kPa

.5 Lube oil temperature in °C

.6 Engine coolant temperature in °C

.7 Exhaust stack temperature in °C

.8 Alternator voltage: phase 1, 2, 3

.9 Alternator current: phase 1, 2, 3

.10 Power in kW

.11 Frequency in Hz

.12 Power factor

.13 Battery charger current in A

.14 Battery voltage

.15 Alternator cooling air outlet temperature.

.2 After completion of 8 h run, demonstrate following shutdown devices and alarms:

.1 Over-cranking

.2 Overspeed

.3 High engine temperature

.4 Low lube oil pressure

.5 Short circuit

.6 Alternator over-voltage

.7 Low battery voltage, or no battery charge

.8 Manual remote emergency stop

.9 High alternator temperature.

.3 Next, install continuous strip chart recorders to record frequency and voltage variations during load switching procedures. Each load change delayed until steady state conditions exist. Switching increments to include:

.1 No load to full load to no load

.2 No load to 70% load to no load

.3 No load to 20% load to no load

.4 20% load to 40% load to no load

.5 40% load to 60% load to no load

.6 60% load to 80% load to no load.

.4 Demonstrate:

. Automatic starting of set and automatic transfer of load on failure of normal power.

.. Operation of manual bypass switch

. Automatic shutdown of engine on resumption of normal power

.. That battery charge reverts to high rate charge after cranking.

.5 Demonstrate low oil pressure and high engine temperature shutdown devices operation without subjecting engine to these excesses.

2. PRODUCTS

2.1 Diesel Engine

.1 Diesel Engine: to ISO 3046/1.

.1 Engine: standard product of current manufacturer, from company regularly engaged in production of such equipment.

.2 Turbo charged, synchronous speed 1800 r/min.

.3 Cooling System:

.1 Liquid cooled: double walled shell and tube heat exchanger with Dow "Frost" anti-freeze, non-sludging above minus 46°C.

.2 Block heater: thermostatically controlled lube oil or liquid cooled heater connected to line side of automatic transfer switch to allow engine to start in room ambient 0°C.

.4 Fuel:

.1 Arctic Grade 2: to CGSB 3-GP-6c.

.5 Fuel System: Solid injection, mechanical fuel transfer pump with hand primer, fuel filters and air cleaner, fuel rack solenoid energized when engine running.

.6 Fuel lines to be braided hard duty flexible connectors. Standard hoses are not acceptable.

.7 Governor:

.1 Electronic load sharing type, electric actuator, speed droop externally adjustable from isochronous to 5% temperature compensated with steady state speed maintenance capability of plus or minus 0.25%.

.8 Lubrication System:

.1 Pressure lubricated by engine driven pump

.2 Lube oil filter: replaceable, full flow type, removable without disconnecting piping

.3 Lube oil cooler

.4 Engine sump drain valve

.5 Oil level dip-stick.

.9 Starting System:

.1 Positive shift, gear engaging starter 12 or 24 V dc

.2 Cranking limiter to provide 6 cranking periods of 10 s duration, each separated by 5 s rest.

.3 Lead acid, 12 or 24 V storage battery with sufficient capacity to crank engine for 1 min. at 0°C without using more than 25% of ampere hour capacity.

.4 Two CSA approved jacket water heaters with thermostatic control to maintain engine temperature at a sufficient level to maintain normal engine starting temperatures.

.5 Battery Charger: constant voltage, solid state, two stage from trickle charge at standby to boost charge after use. Regulation: plus or minus 2% output for plus or minus 10% input variation. Equipped with dc voltmeter, dc ammeter, and on-off switch. Minimum charger capacity: 7 A.

.10 Vibration Isolation Engine Instrument Panel with:

.1 Lube oil pressure gauge

.2 Lube oil temperature gauge

.3 Coolant temperature gauge

.4 Coolant level gauge

.5 Running time meter: non-tamper type.

.11 Guards to protect personnel from hot and moving parts. Locate guards so that normal daily maintenance inspections can be undertaken without their removal.

.12 Drip tray.

2.2 Alternator

.1 Alternator: to ANSI/NEMA MG1.

.2 Rating: 3 phase, 347/600 V 4 wire, 100 kW, 60 Hz, at 0.8 PF.

.3 Output at 40°C ambient:

.1 100% full load continuously
.2 150% full load for 1 min.

.4 Revolving field, brushless, single bearing.

.5 Drip-proof.

.6 Amortisseur windings.

.7 Synchronous type.

.8 Exciter: permanent magnet.

.9 EEMAC class H insulation of windings.

.10 Platinum resistance temperature transducers embedded in stator winding and connected to alternator control circuitry.

.11 Voltage regulator: thyristor controlled rectifiers with phase controlled sensing circuit:

.1 Stability: 0.25% maximum voltage variation at any constant load from no load to full load.

.2 Regulation: 1.5% maximum voltage deviation between no-load steady state and full load steady state.

.3 Transient: 10% maximum voltage dip on one-step application of 0.8 PF full load.

.4 Transient: 12% maximum voltage rise on one-step removal of 0.8 PF full load.

.5 Transient: 1 s maximum voltage recovery time with application or removal of 0.8 PF full load.

.12 Alternator: capable of sustaining 300% rated current for period not less than 10 s permitting selective tripping of down line protective devices when short circuit occurs.

2.3 Control Panel

.1 Totally enclosed, mounting base isolated from diesel generator

.2 Instruments:

.1 Digital 100% solid state circuitry indicated type 2 % accuracy rectangular face, flush panel mounting:

.1 Voltmeter: ac, scale 0 to 650 V
.2 Ammeter: ac, scale 0 to 400 A
.3 Wattmeter: scale 0 to 250 kW
.4 Frequency meter: scale 55 to 65 Hz
.5 kVAR meter
.6 kW.h meter.

.2 Voltmeter selector switch, four position, labelled "Off-Phase A-Phase B-Phase C".

.3 Controls:

.1 Engine start button

.1 Selector switch: Off-Auto-Manual – Test full load - test no load.

.2 Engine emergency stop button and provision for remote emergency stop button.

.2 Alternator Output Breaker:

.1 Circuit Breaker: bolt-on, moulded case, temperature compensated for 40°C ambient, dual thermal-magnetic trip.

.3 Voltage control rheostat: mounted on the inside of the control panel.

.4 Operating lights, panel mounted:

.1 "Normal power" pilot light

.2 "Emergency power" pilot light

.3 Green pilot lights for breaker on and red pilot lights for breaker off.

.5 Solid state indicator lights for alarm with 2 sets manually resent NO/NC contacts wired to terminal block for remote annunciation on:

.1 Low fuel level

.2 Low battery level

.3 Ventilation failure

.4 Low coolant temperature.

.6 Solid state controller for automatic shutdown and alarms with 2 sets manual reset NO/NC contacts wired to terminal block for remote annunciation on:

.1 Engine over-crank

.2 Engine overspeed

.3 Engine high temperature

.4 Engine low lube oil pressure

.5 Short circuit

.6 AC over-voltage.

Lamp test button.

.8 Provision for remote monitoring.

2.4 Automatic Transfer Switch

.1 Refer to Section 16627 – Automatic Load Transfer Equipment.

2.5 Steel Mounting Base

.1 Complete generating set mounted on structural steel base of sufficient strength and rigidity to protect assembly from stress or strain during transportation, installation, and under operating conditions on suitable level surface.

.2 Assembly fitted with vibration isolators and control console resiliently mounted.

.1 Spring-type isolators with adjustable side snubbers and adjustable for levelling.

.3 Sound insulation pads for installation between isolators and concrete base.

2.6 Exhaust System

.1 Heavy duty critical grade, Cowl, spiral chamber exhaust as per Section 16623.

.2 Heavy duty flexible exhaust pipe with flanged couplings as required.

.3 Fittings and accessories as required.

.4 Expansion joints: stainless steel, corrugated, of suitable length, to absorb both vertical and horizontal expansion.

2.7 Fuel Day Tank System

.1 Supplied and installed by Division 15.

2.8 Finishes

.1 Apply finishes in accordance with Section 16010 – Electrical General Requirements.

.2 Alternator control cubicle: paint inside, exterior to match engine and alternator

.3 Other ducts and racks: grey.

.4 Supply 0.25 L of touch-up enamel.

2.9 Equipment Identification

.1 Provide equipment identification in accordance with Section 16010 – Electrical General Requirements.

.2 Control Panel:

.1 Nameplates for controls such as alternator breakers and program selector switch.
.2 Nameplates for meters, alarms, indicating lights, and minor controls.

2.10 Fabrication

.1 Shop assemble generating unit including:

- .1 Base
- .2 Engine [and radiator]
- .3 Alternator
- .4 Control panel
- .5 Battery and charger
- .6 Automatic transfer equipment.

2.11 Manufacturer

.1 Onan, Kohler

3. EXECUTION

3.1 Installation

.1 Locate generating unit and install as indicated.

.2 Install fuel supply system as indicated, and coordinate work with Division 15.

.3 Install ventilation components as indicated.

.4 Pipe muffler drains to nearest floor drain.

.5 Complete wiring and interconnections as indicated.

.6 Remove air shipping blocks, packing, etc.

.7 Start generating set and test to ensure correct performance of components.

3.2 Field Quality Control

.1 Perform tests in accordance with Section 16980 – Testing, Adjusting, and Balancing of Electrical Equipment and Systems, and as specified herein.

.2 Operation of all components to be demonstrated – battery charger, alarm devices, transfer switch, block heaters, controls, and all other components making up the overall system.

.3 Using a resistive load bank, 100% of alternator rating, perform a functional test of all equipment and record the following:

- .1 Engine oil pressure
- .2 Water temperature
- .3 Cranking time to start

.4 Time to achieve standby power operation

.5 Time delay on start

.6 Time delay on retransfer to normal

.7 Voltage current, every 15 minutes, for 1 hour.

.4 Perform a 8-hour full load acceptance test, using a 110% rated resistive load bank, as follows:

.1 100% rated kW load (at 100% PF) for 8 hours.

.2 If the generator system fails testing, make any necessary adjustments or repairs and repeat testing for 8 hours at 100% load.

.3 The above on-site tests are to be carried out only after the unit has been verified in writing by the manufacturer or his representative as being installed and assembled correctly and all associated components and utilities are properly connected.

.4 Include all fuel costs for testing in tender, and upon completion of testing, leave tanks filled to capacity.

.5 Observe and document voltage, current, oil pressure, water temperature, and frequency at 15 min. intervals.

.5 Upon completion of successful testing, arrange and pay for demonstration and training to the Owner by an authorized factory representative.

END OF SECTION

DIESEL GENERATOR ACCESSORIES

1. GENERAL

1.1 Work Included

.1 Supply and install an exhaust system and a fuel system for an emergency diesel generator.

1.2 Code Requirements

.1 NFPA Number 37, Installation and Use of Stationary Combustion Engines and Gas Turbines.

.2 CSA standard B139, Installation Code for Oil Burning Equipment.

.3 The Fire Prevention Act, Alberta Regulation 356, Bulk Plant Regulations.

.4 The Fire Prevention Act, Alberta Regulation 357, Service Station and Garages Regulation.

.5 CSA standard 183, including all supplements.

.6 All codes are as amended or supplemented by Provincial, Municipal or other regulatory agencies having jurisdiction.

2. PRODUCTS

2.1 Muffler

.1 Cowl Spiral Chamber silencer as manufactured by Phillips & Temro Industries Ltd. Model Type SL.

2.2 Exhaust Flexible Connection

.1 Flexible connection, bellows type, 18 inch total length, mild steel construction.

2.3 Exhaust Pipe

.1 ASTM-A-120-55 Schedule 20 steel.

.2 Carbon steel welding fittings or flanged as required.

.3 Diameter to suit manufacturer's recommendations.

2.4 Fuel Oil Storage Day Tank

.1 Supplied and installed by Division 15.

3. EXECUTION

3.1 Diesel Generator Exhaust System

.1 Install exhaust system as detailed on the mechanical drawings.

.2 Exhaust pipe mechanical jointing to be welded with flanges

END OF SECTION

AUTOMATIC LOAD TRANSFER EQUIPMENT

1. GENERAL

1.1 References

.1 CAN3-C13, Instrument Transformers

.2 CAN3-C17, Alternating-Current Electricity Metering.

.3 ANSI/NEMA ICS 2, Industrial Control Devices, Controllers, and Assemblies.

1.2 System Description

.1 Automatic load transfer equipment which electrically operated, mechanically held to:

.1 Monitor voltage on all 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 all 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.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 16010 - Electrical General Requirements.

.2 Include:

.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.

1.4 Operation and Maintenance Data

.1 Provide operation and maintenance data for automatic load transfer equipment for incorporation into manual specified in Section 16010 - Electrical General Requirements.

.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.

1.5 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 all 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.

2. PRODUCTS

2.1 Materials

.1 Meters: to CAN3-C17.

.2 Instrument transformers: to CAN3-C13.

.3 Contactors: to ANSI/NEMA ICS 2.

2.2 Contactor Type Transfer Equipment

.1 Two – 3 phase contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, solenoid operated, mounted in the main electrical distribution equipment as indicated on drawings.

.2 Rated: 347/600 V, 60 Hz, 200 A. 4 wire, solid neutral.

.3 Main contacts: silver surfaced, protected by arc disruption means including separate arcing contacts, arc splitters and blow out coils for load current.

.4 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].

.5 Auxiliary contact: to initiate emergency generator start-up on failure of normal power.

.6 Fault withstand rating: 22kA symmetrical for 3 cycles with maximum peak value of 50 kA.

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

2.3 Controls

.1 Selector switch – four position "Test", "Auto", "Manual", "Engine start".

.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 Manual position – Transfer switch may be operated by manual handle but transfer switch will not operate automatically and engine will not start. If the transfer switch is on manual operation mode, a red light should indicate a warning on the control panel and auxiliary contact to be provided for transferring this signal to off site.

.4 Engine start position - Engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.

.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, one per 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 overvoltage protection. Voltage sensing to initiate transfer of the load when normal power supply drops to 70% in any phase and pick up at 90% on all phases.

.2 Time delay, normal power to standby, adjustable solid state, 5 seconds to 180 seconds

.3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 1 to 60 seconds delay.

.4 Time delay on retransfer from standby to normal power, adjustable 20 seconds to 30 min.

.5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 20 seconds intervals to 10 min].

.6 Time delay during transfer to stop transfer action in neutral position electrically to prevent fast transfer, adjustable, 5 seconds intervals to 180 seconds.

.7 Frequency sensing, to prevent transfer from normal power until supply until frequency of standby unit reaches preset adjustable values.

.4 Solid state electronic in-phase monitor.

2.4 Accessories

.1 Pilot lights to indicate switch position, green for normal, red for standby, mounted in panel.

.2 Solid neutral bar, rated: 200 A.

.3 Overlapping neutral contacts on contactor type transfer equipment.

.4 Auxiliary relay to provide 2 N.O. and 2 N.C. contacts for remote alarms.

.5 Test pushbutton (momentary contact) to simulate failure of normal power.

2.5 Equipment Identification

.1 Provide equipment identification in accordance with Section 16010 – Electrical General Requirements.

2.6 Acceptable Manufacturers

.1 Onan, Kohler.

3. EXECUTION

3.1 Installation

.1 Locate, install and connect transfer equipment.

.2 Check solid state monitors and adjust as required.

.3 Install and connect battery and alarms.

3.2 Field Quality Control

.1 Perform tests in accordance with Section 16980 - Testing, Adjusting and Balancing of Electrical Equipment and Systems.

.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 "Manual" position and check to ensure proper performance.

.5 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.

.6 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] min, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.

END OF SECTION