

GENERAL

1 The electrical system shall comply with the requirements of the latest edition of the Canadian Electrical Code and with all provincial and municipal laws, rules and ordinances, and to the authority having jurisdiction and owner.

WORK IN EXISTING BUILDING

1 The building shall remain open and in normal operation during the construction period.

CLEANING

1 Maintain the work in tidy condition, free from the accumulation of waste products and debris.

WIRING METHODS

1 Conductors shall be copper. Minimum wire size shall be #12 AWG RW90 unless as noted.

PANELBOARDS

1 Install circuit breakers in panelboards before shipment.

DELIVERABLES

1. Contractor shall maintain at the job site one set of plans, which he shall clearly note all changes or deviations from the contract document as the job progress.

GENERATOR SET

GENERAL

1. Shop Drawings and Product Data: 1.1. Submit shop drawings for review and approval. Include: a) Engine: make and model, b) Alternator: make and model, c) Voltage regulator make, model and type, d) Automatic transfer switch: make, model and type, e) Battery: make, type and capacity, f) Battery charger: make, type and model, g) Governor type and model, h) Continuous full load output of set at 0.8 pf lagging, i) Description of set operation including: -automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency -manual starting -automatic shutdown and alarm on: \*overcranking \*overspeed \*high engine temperature \*low lube oil pressure j) Over and under frequency protection, k) Over and under voltage protection, l) Enclosure construction shop drawings, m) Alarms and extra contacts.

2. Testing

a) Design Prototype Tests: (1) Maximum power (kW). (2) Maximum motor starting (kVA) at 35% instantaneous voltage dip. (3) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.40. (4) Governor speed regulation under steady-state and transient conditions. (5) Voltage regulation and generator transient response. (6) Harmonic analysis, voltage waveform deviation, and telephone influence factor. (7) Three-phase short circuit tests. (8) Alternator cooling air flow. (9) Torsional analysis to verify that the generator set is free of harmful torsional stresses. (10) Endurance testing. b) Production Tests - Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include: • Single-step load pickup. • Transient and steady-state governing. • Safety shutdown device testing. • Voltage regulation. • Rated Power @ 0.8 PF • Maximum Power. • A certified test record to be sent prior to shipment. c) Site Tests (1) Site Tests: An installation check, start-up, and building load test shall be performed by the manufacturer's local representative. (2) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected. (3) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. (4) Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and frequency, and phase rotation.

PRODUCTS

1 Generator Set a) The generator set shall be rated 13 kW stand by rating, 120/208 V 3ø / 4 wire, 0.8 power factor, 60Hz, using natural gas as fuel. b) Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base. c) Acceptable genset manufacturers shall be Kohler, Onan and Caterpillar.

1.1 Engine

a) The engine shall be complete with an electronic isochronous governed speed of 1800 rpm, capable of +0.5% steady-state frequency regulation, 70-Ampere minimum automatic battery charging alternator with solid-state voltage regulation, full pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain, dry-type replaceable air cleaner elements for normal applications. b) The naturally aspirated engine shall be fuelled with natural gas and be supplied with a unit-mounted electric solenoid fuel shut-off valve, flexible fuel line, and secondary fuel pressure regulator. c) The engine shall have a minimum of 4 cylinders, and be liquid-cooled by a unit-mounted radiator, blower fan, water pump, and thermostats.

1.2 Cooling System

a) A unit mounted radiator for the standby generator set to be complete with all necessary connections. b) Provide air intake motorized dampers to open to provide cooling/combustion air during operating conditions.

1.3 Alternator

a) The alternator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. b) The alternator having a single maintenance-free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

1.4 Generator Controller

a) Applicability •The control must be usable on 12 volt starting systems. •Environment: -20°C to +70°C operating temperature range (without starting aids); 5-95% humidity, condensing. •The control shall be mounted on the generator set or mounted on the generator set sound shield/enclosure. b) Hardware Requirements •The control shall have a run-off/reset-auto three-position master switch. •The master switch reset will also be used to clear alarms. •Light-emitting diode (LED) display for viewing faults (warnings and shutdowns), runtime, and make setup adjustments. •Sealed keypad for menu selection and data entry. •The control shall include potted electronics and sealed connections for environmental protection. c) Control Functional Requirements •Field programmable adjustments for voltage, voltage gain, volts/hertz, governor speed, and governor gain. •Field programmable adjustments of generator model, phase, frequency, voltage, magnetic pick-up, battery voltage, and communication settings. •Programmable cyclic cranking for six crank cycles, 15 seconds per crank cycle, and time delay at start of crank cycle to allow solenoid action. •A digital voltage regulator must be in the controller software. d) Generator System Monitoring Requirements - The following generator functions must be monitored and annunciated: (1) Generator runtime (2) Crank Cycle Fault (3) High Battery Voltage Fault (4) High Engine Temperature Fault (5) Low Battery Voltage Fault (6) Low Coolant Level Fault (7) Loss of Coolant Fault (8) Low Oil Pressure Fault (9) Overcrank Fault (10) Over Frequency Fault (11) Overspeed Fault (12) Over Voltage Fault (13) Under Frequency Fault (14) Under Voltage Fault

1.5 Accessories

a) An 80% rated line circuit breaker of 60 amperes, 60 amps sensor, 600 volt rated, molded case type, generator mounted. b) Engine block heater thermostatically controlled and sized to maintain manufacturer's recommended engine coolant temperature to meet the start-up requirements of NFPA-99 and NFPA-110, Level 1. c) 6-Ampere automatic float and equalize battery charger with +/- 1% constant voltage regulation from no load to full load over +/-10% AC input line variation, current limited during engine cranking and short circuit conditions, temperature compensated for ambient temperatures from -40oC to +60oC, 5% accurate voltmeter and ammeter, fused, reverse polarity and transient protected. d) Fuel shut-off solenoid valve. e) Starting battery and cables. f) 12V starter motor.

1.6 Weatherproof enclosure:

a) Constructed from G60 galvanized high strength, low alloy steel. b) Primed and finish coated with paint. Enclosures will be finished in the manufacturer's standard color. c) The enclosures must allow the generator set to operate at full load in an ambient of 40°C with no additional derating of the electrical output. d) Enclosures must be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. e) Doors must be hinged with stainless steel hinges and hardware and be removable. f) Doors must be equipped with lockable latches. Locks must be keyed alike. g) Enclosures must be mounted to the generator set skid. h) The enclosure roof must be pitched to prevent accumulation of water. i) A duct between the radiator and air outlet must be provided to prevent re-circulation of hot air. j) The complete exhaust system shall be internal to the enclosure. Enclosures with roof mounted or externally exposed silencers are not acceptable. k) The silencer shall be an insulated critical silencer with a tailpipe and rain cap. l) The unit shall have motorized dampers installed for cooling/combustion air, 500W 120V 1ø space heater c/w thermostat to maintain ambient enclosure temperature and 2 120V receptacles.

2 TRANSFER SWITCH

2.1 Transfer switch shall be 60 Amp current rating, 208 V, 3 Pole, 4 wire, 3 phase, 60Hz, solid Neutral. 2.2 Mechanical Requirements a) All main contacts shall be of silver composition. b) All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors. c) All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

2.3 Transfer Switch Control System

a) The control module shall direct the operation of the transfer switch. b) The control module shall be mounted separately from the transfer mechanism unit for safety and ease of maintenance. c) The control module shall include a user interface keypad with tactile feedback pushbuttons and light-emitting diode status indication. -Keypad pushbuttons: •Start/end system test •Lamp test/service reset - Light-emitting diode status indicators: •Contactor Position: Normal, Off, Emergency •Not in automatic mode

2.4 Output

a) Generator engine start. b) Pre-transfer load control. c) Generator running output. d) 2 additional NO&NC generator status contacts (running/off)

2.5 Operation

a) All phases of normal and all phases of emergency shall be monitored for over and under voltage and single phase of normal and emergency for over- and under-frequency. b) Emergency generator shall start on a signal from transfer switch, on loss of normal power and transfer the transfer switch. c) Selector switch in auto position and the normal supply voltage operating, the generator unit is on "automatic service" and shall start and transfer automatically on power failure. d) Selector switch in "manual" position, engine starts and runs up to output until shut off manually. e) Selector switch in "test" position, engine starts and system transfer switch, to emergency service.

Project information block including: THE CITY OF WINNIPEG PUBLIC WORKS DEPARTMENT, PROJECT: Emergency System Upgrade, SHEET TITLE: Conditions, and professional engineer stamp for G.W. ALCOCK.