

Approved: 2006-06-30

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Contract Administrator submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples, and mock-ups in SI Metric units.
- .4 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator review of submittals.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved Contract Administrator review.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow seven (7) days for Contract Administrator review of each submission.
- .4 Adjustments made on shop drawings Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .5 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter, containing:
 - .1 Date
 - .2 Project title and number

- .3 Contractor's name and address
- .4 Identification and quantity of each shop drawing, product data and sample
- .5 Other pertinent data
- .7 Submissions include:
 - .1 Date and revision dates
 - .2 Project title and number
 - .3 Name and address of:
 - .1 Subcontractor
 - .2 Supplier Manufacturer
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances
 - .3 Setting or erection details
 - .4 Capacities
 - .5 Performance characteristics
 - .6 Standards
 - .7 Operating weight
 - .8 Wiring diagrams
 - .9 Single line and schematic diagrams
 - .10 Relationship to adjacent work
- .8 Submit electronic copy of shop drawings for each requirement requested in specification sections and as Contract Administrator may reasonably request.
- .9 Submit electronic copies of product data sheets or brochures for requirements requested in specification sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.
- .10 Submit electronic copies of test reports for requirements requested in specification sections and as requested by Contract Administrator.
- .11 Submit electronic copies of manufacturer's instructions for requirements requested in specification sections and as requested by Contract Administrator.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards, and safety precautions.
- .12 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Contract Administrator. Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

- .13 Submit six (6) hard copies and one (1) electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Contract Administrator.
- .14 Delete information not applicable to project.
- .15 Supplement standard information to provide details applicable to project.
- .16 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made electronic copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .17 Contractor will be charged for Contract Administrator subsequent reviews of submittal packages exceeding two (2) submissions.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final inspection, with Contract Administrator comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two (2) weeks after equipment delivery provide six (6) final hard copies and one (1) electronic copy of operating and maintenance manuals in English.
- .6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7 Furnish evidence, if requested, for type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

1.2 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems under section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project, Date of submission, names.
 - .1 Addresses and telephone numbers of Contract Administrator and Contractor with name of responsible parties.
 - .2 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses, and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.4 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of Drawings.
- .2 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail
 - .2 Changes made by change orders
 - .3 Details not on original Contract Drawings
 - .4 References to related shop drawings and modifications
- .4 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .5 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.5 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .12 Include test and balancing reports.
- .13 Additional requirements: as specified in individual specification sections.

1.6 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.

1.7 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.

1.8 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.

- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed.

1.9 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Contract Administrator

1.10 WARRANTIES

- .1 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty with index tab sheets keyed to Table of Contents listing.
 - .2 List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .2 Except for items put into use with City's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .3 Conduct joint 11 month warranty inspection, measured from Date of Substantial Performance, by Contract Administrator.
- .4 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .5 Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Approved: 2005-12-31

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 General requirements that are common to NMS sections found in Division 26 - Electrical

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1 (19th Edition), Safety Standard for Electrical Installations
 - .2 CSA C22.2 No. 7, Underground Systems
 - .3 CAN/CSA-C22.3 No. 1, Overhead Systems
 - .4 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS)

1.3 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices, and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 Indicate on Drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .4 If changes are required, notify Contract Administrator of these changes before they are made.

.3 Quality Control

.1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material inspection authorities for special acceptance approval before delivery to Site.

.2 Submit test results of electrical systems and instrumentation.

.4 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within three (3) days of review, verifying compliance of Installation Work and electrical system and instrumentation.

1.5 QUALITY ASSURANCE

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

1.6 SYSTEM STARTUP

.1 Assist installation contractor with the verification of proper installation, Site start-up, commissioning, and testing.

.2 Instruct Contract Administrator and City staff in operation, care and maintenance of systems, system equipment, and components.

.3 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components, and instruct operating personnel.

.4 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to Site and submit such approval as described in Section 1.4 - Submittals.

.2 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities, and City.

2.4 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
 - .1 Nameplates: lamacoid 3 mm black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Wording on nameplates to be approved by Contract Administrator prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .6 Terminal cabinets and pull boxes: indicate system and voltage.
- .7 Transformers: indicate capacity, primary, and secondary voltages.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light gray EEMAC 2Y-1.

Part 3 Execution

3.1 INSTALLATION

- .1 Assist installation contractor to ensure complete installation is in accordance with CSA C22.1.

3.2 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.4 FIELD QUALITY CONTROL

- .1 Carry out tests in presence of Contract Administrator.
- .2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .3 Manufacturer's Field Services:
 - .1 Provide written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Section 1.4 - Submittals.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule Site visits, to review Work.

END OF SECTION

Approved: 2003-12-31

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for liquid cooled electric generating unit.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.

1.3 REFERENCES

- .1 Canadian Standards Association, (CSA International)
 - .1 CAN3-Z299.3, Quality Assurance Program - Category 3
 - .2 CAN/CSA-C282-00, Emergency Electrical Power Supply for Buildings
 - .3 CSA B149.1-00 Natural Gas and Propane Installation Code
- .2 International Organization for Standardization (ISO)
 - .1 ISO 3046-1, Reciprocating internal combustion engines - Performance - Part I: Declarations of power, fuel and lubricating oil consumptions, and test methods - Additional requirements for engines for general use.
 - .2 ISO 3046-4, Reciprocating internal combustion engines - Performance - Part 4: Speed governing.
- .3 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA MG 1, Motors and Generators
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - [March 1998]
- .5 The Society of Automotive Engineers (SAE)

1.4 SYSTEM DESCRIPTION

- .1 Provide automatic, unattended, standby power supply system consisting of:
 - .1 Liquid cooled low voltage natural gas electric generating unit with combined control, and transfer panel.
 - .2 Accessories and equipment specified in this specification.
- .2 Provide design, fabrication, testing, transportation, demonstration, and equipment warranty.

1.5 DESIGN REQUIREMENTS

- .1 Design equipment to meet following requirements:
 - .1 Generator size: 347/600VAC, 45kW, 3 phase, 4 wire
 - .2 Total load: 30 kW
 - .3 Motor load: 22.5 kW
 - .4 Largest motor: 7.5 kW
 - .5 Voltage: 600 V
 - .6 Frequency: 6 Hz
 - .7 Phase/Wire.3/4
 - .8 Power factor: 0.8
 - .9 Load harmonic content: 20% THD
 - .10 Maximum rotational speed: 1800 rpm
 - .11 Interrupting capacity: 42kAIC
 - .12 Duty rating: full load continuous
 - .13 Performance: automatic
 - .14 Elevation above sea level: 152 m
 - .15 Ambient temperature: 40 °C
 - .16 Relative humidity: 95 %
- .2 Physical dimensions:
 - .1 Length: 2000 mm, maximum
 - .2 Width: 864 mm, maximum
 - .3 Exhaust Outlet Height: 813 mm, maximum
- .3 Room intake and exhaust louver opening sizes
 - .1 Intake:
 - .1 Width: 1042 mm, maximum
 - .2 Height: 1313 mm, maximum
 - .2 Exhaust:
 - .1 Width: 936 mm, maximum
 - .2 Height: 1181 mm, maximum
- .4 Exhaust discharge height: 1575 mm
- .5 Design unit capable of starting, attaining settled voltage and frequency limits and accepting eighty percent (80%) full rated load with voltage and frequency settling to specified steady state bands, within fifteen (15) seconds for any temperature between 0°C to 40 °C.
- .6 Use engine manufacturer's standard, published continuous (prime) horsepower rating in assessing engine capacity and derate this rating for specified conditions and engine driven accessories in accordance with ISO 3046-1.
- .7 Description of generating set operation:

- .1 Automatic starting on abnormal or loss of normal voltage: voltage sensing relays to sense three (3) phases of hydro supply. If voltage on any one phase should drop below pre-set limits (adjustable) for adjustable period of time, close engine start contact, and start engine.
- .2 When emergency supply has reached settled voltage and frequency pre-set limits (adjustable) transfer switch will transfer load to emergency supply.
- .3 Continue to supply load until hydro supply returns or set is shut down manually or under failure conditions.
- .4 On hydro restoration, confirmed by three (3) phase sensing of voltage above adjustable pre-set, for time period in excess of three (3) minutes (adjustable), transfer switch will transfer load to hydro supply. Provide dead bus timer to allow motor starters to drop out and motors to stop prior to connecting to hydro.
- .5 Adjustable time delay relay to allow engine to run unloaded to cool down and subsequently to shut down, ready for next cycle.
- .6 Equip engine with key switch with following positions: auto-off-crank-start, key removable in auto position only.
- .7 Automatic shut down on:
 - .1 Overcranking
 - .2 Overspeed
 - .3 High Engine Temperature
 - .4 Low lubricating oil pressure
 - .5 Over and under frequency
 - .6 Emergency breaker failure
 - .7 Electrical fault lock-out on short circuit and generator over and undervoltage

1.6 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Dimensions and data in metric units and symbols followed by in bracket imperial units and symbols wherever applicable.
- .2 Include the following:
 - .1 Engine: make, model, rating and performance curves
 - .2 Starter motor, make model
 - .3 Generator: make, model and rating complete with generator saturation curves, heat damage curves, reactive capability and special data
 - .4 Voltage regulator: make, model, type
 - .5 Governor: type, model
 - .6 Battery: make, type, voltage, capacity
 - .7 Charger: make, model, input and output rating
 - .8 Submit general outline drawing of complete assembly showing engine, radiator and generator mounting, exhaust, exhaust gas silencer and pipe arrangement, locations of fuel and lubricating oil filters, fuel supply and return line connections, lubricating oil drain valve, radiator and coolant drain valves, air cleaner, engine

instrument panel, starting motor, power and control junction boxes, engine and generator mounting feet. Indicate on drawings:

- .1 Horizontal and vertical dimensions
- .2 Minimum door opening required for moving unit
- .3 Head room required for removal of piston and connecting rod
- .4 Weight of engine, generator, baseplate, radiator, and exhaust silencer
- .9 Identify exact locations and details where necessary of interconnecting services
- .10 Baseplate construction details and materials
- .11 Transfer and bypass system: make, model, type
- .12 Outline and layout of panels
- .13 Schematic and wiring diagrams of engine, generator, control panel, automatic transfer and bypass panels complete with interconnecting wiring diagrams
- .14 Field wiring diagrams
- .15 Complete bill of materials, including manufacturer's name, catalogue numbers and capacity

1.7 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for generating units for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Provide following in English for incorporation into instruction manuals:
 - .1 Complete set of reviewed shop drawings
 - .2 Factory test data of engine, generator, exciter, control logic, metering and other pertinent test data
 - .3 Maintenance and operation bulletins for:
 - .1 Engine and Accessories
 - .2 Generator
 - .3 Voltage Regulator and Accessories
 - .4 Exciter
 - .5 Permanent magnet generator if installed
 - .6 Battery charger
 - .7 Speed Governor
 - .8 Starting Motor
 - .9 Batteries
 - .10 Ventilating Equipment
 - .11 Timers, Relays, Meters
 - .12 Power Circuit Breakers
 - .13 Controller, Contactors
 - .14 Other Accessories
 - .4 Submit original brochures; photocopies are not acceptable. Include technically relevant data.
 - .5 Complete sequence of system operation.

.6 Complete bill of materials including nameplate data of equipment and accessories.

1.8 QUALITY ASSURANCE

.1 Do Work in accordance with CAN3-Z299.3.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Prepare, crate, and protect equipment against shipping and storage damage.

1.10 WARRANTY

.1 For the Work of this Section, the twelve (12) months warranty period prescribed in the General Conditions is extended to sixty (60) months or fifteen hundred (1500) operating hours, whichever occurs first.

1.11 MAINTENANCE - EXTRA MATERIALS

.1 For panels provide following:

- .1 One spare control circuit breaker per rating
- .2 Six (6) spare indicating light bulbs per rating
- .3 One (1) spare control relay and socket per rating and contact arrangement
- .4 One (1) spare contactor operating coil

.2 Provide generator unit with standard set of engine manufacturer's spare parts for one (1) year normal operation. Spares to include:

- .1 Two (2) lubricating oil filter elements
- .2 Two (2) air cleaner elements
- .3 Two (2) sets of fuses for control panel

.3 Where metric size nuts and bolts are used, provide one set of sockets complete with ratchet handle and set of combination wrenches, to fit sizes used.

.4 Provide conclusive evidence that Canadian distributor has been established and will stock in Canada spare parts likely to be required during normal life of engine.

1.12 MAINTENANCE - TOOLS

.1 Supply suitable engine barring device and battery manufacturer's standard set of tools for battery service:

- .1 Battery service tools to include hydrometer, one (1) plastic bottle for topping up purposes and one (1) insulated battery terminal wrench.

.2 Provide complete set of specialized tools required for proper care, adjustment, and maintenance of equipment supplied.

Part 2 Products

2.1 ASSEMBLY

- .1 Provide following items plus such other items as necessary to make unit complete:
 - .1 Natural Gas Engine
 - .2 Engine Accessories
 - .3 Baseplate and Drip Pan
 - .4 Vibration isolators
 - .5 Governor
 - .6 Engine Exhaust System
 - .7 Engine Cooling System
 - .8 Engine Ventilating System
 - .9 Starting Motor
 - .10 Batteries and Rack
 - .11 Battery Charger
 - .12 Generator and Exciter
 - .13 Voltage Regulator and Accessories
 - .14 Combined Control, Transfer Panel
 - .15 Spares and Accessories

2.2 MOUNTING

- .1 Connect engine flywheel housing rigidly to generator stator housing with SAE adapter.
 - .1 Mount unit on common, heavy duty fabricated steel baseplate.
- .2 Baseplate: rigid material to maintain alignment of engine-generator shafts and frames under shipping, installation, and service conditions.
- .3 Install machine engine-generator feet and baseplate sole plates parallel and true.
 - .1 Shims: steel type, installed under generator feet.
- .4 Support baseplate on spring type isolating fixtures from welded side brackets located to support bottom of baseplate 25 mm above supporting floor:
 - .1 Isolators: cast iron housings, complete with levelling bolts, adjustable oil proof snubbers and minimum 6 mm sound pads
 - .2 Isolation efficiency ninety-five percent (95%) minimum
- .5 Determine quantity and location of isolators. Locate each isolator to carry equal proportion of weight and that pressure exerted on floor by each isolator does not exceed 345 kPa.
- .6 Ship isolators loose for installation at project Site.

2.3 GAS ENGINE

- .1 Natural gas, heavy duty, cold start, liquid cooled, vertical in-line or vee, and current manufacture of a type and size that has been service as a prime mover for electric power generation for not less than two (2) years.
 - .1 Turbo supercharged engine acceptable providing brake mean effective pressure (BMEP) at rated output does not exceed 1800 kPa.
 - .2 Mechanically driven superchargers not acceptable.
- .2 Engine: minimum of four (4) cylinders.
- .3 Engine with auxiliary starting aids not acceptable.
- .4 Equip engine air intakes with dry type heavy duty air cleaners located close to inlet manifold.
 - .1 Cleaner element: directly replaceable with elements of Canadian manufacture.
- .5 Provide engine wiring in liquid-tight conduit and fittings with insulated bushings.
 - .1 Use stranded, minimum No.14 AWG, TEW 105°C and coloured coded wires.
 - .2 Terminate wiring with coded, insulated terminals flanged fork type. Terminal blocks heavy duty, screw type.
 - .3 Wire markers of slip on oil proof type.
 - .4 Junction boxes on unit of liquid-tight type.
 - .5 Maximum of two wires per terminal block.
- .6 Mount unit accessories, including gauges, instruments, and protective sensors, to isolate or dampen vibrations.
- .7 Engine control panel complete with:
 - .1 Lubricating oil pressure gauge
 - .2 Lubricating oil temperature gauge
 - .3 Coolant temperature gauge
 - .4 Low coolant level gauge
 - .5 Engine switch auto-off-crank-start selector switch and crank pushbutton
 - .6 D.C. main power supply circuit breaker
 - .7 Terminal blocks for connection to D.C. power supply, engine monitoring and shutdown device
 - .8 Provide low oil pressure, high coolant temperature, low coolant level and overspeed protection to shut down engine on manual operation

2.4 COOLING SYSTEM

- .1 Provide complete cooling and ventilating system for unit.
- .2 Thermostatically control system and maintain coolant, ethylene glycol, within engine manufacturer's tolerance, with unit operating at rated load under specified conditions. Cooling system engine mounted radiator type.

- .1 Radiator cooling fan to be pusher type, minimum two belt drive with belt adjuster. Fan, pulley and belt with removable protective cage.
- .3 Provide drain valves for draining coolant from engine block and radiator.
 - .1 Drain coolant conveniently into large container through flexible extensions.
 - .2 Dripping valves or leaking connections will not be permitted.

2.5 LUBRICATION SYSTEM

- .1 Provide full pressure lubricating system complete with filters and oil cooler.
- .2 Oil pump: engine driven gear type complete with strainer.
- .3 Equip filters with automatic by-pass valve and full flow filter elements conveniently located for servicing and directly replaceable with elements of Canadian manufacture.
 - .1 Cooler to have sufficient capacity to maintain oil temperature within engine manufacturer's tolerances with unit operating at rated load under conditions specified.
- .4 Equip engine oil sump with oil drain pipe, gate valve and pipe cap.
 - .1 Permit complete drainage in a convenient manner.
- .5 Ensure unit is able to start and assume full rated load within the specified 15 second time period when, operational requirements are such that unit may lay idle for periods up to one (1) month.
 - .1 Provide electrical motor driven, integrally mounted, gear type oil priming pump with interval timer and breaker type combination starter.
 - .2 Lubrication oil pressure switch to stop priming pump when engine is running.
- .6 Metallic oil hoses: steel reinforced rubber type with crimped or swaged end fittings.

2.6 FUEL SYSTEM

- .1 Natural gas

2.7 EXHAUST SYSTEM

- .1 Heavy duty critical grade horizontally mounted exhaust silencer with condensate drain, plug and flanged couplings. Minimum 20 dBA noise reduction at engine rated output.
- .2 Insulated, ULC listed wall thimble complete with rain guard.
- .3 Heavy duty flexible engine to exhaust system connector, bellows type with flanged couplings, capable of minimum 94 mm lateral flex.

2.8 JACKET COOLANT HEATER

- .1 Provide engine jacket coolant heater complete with 20°C to 60°C adjustable immersion type thermostat. Size heater to maintain coolant at 40°C in an ambient temperature of 15°C.

- .2 Obtain circulation of heated coolant on thermosyphon principle.
 - .1 However, if this does not provide sufficient circulation to avoid hot spots in system, provide electrical motor driven circulating pump to operate automatically when heater is energized.
 - .2 Motor: 120V single phase splash-proof type complete with breaker type combination starter.

2.9 SPEED GOVERNOR

- .1 Provide full electronic governor with speed changer and dry type actuator.
 - .1 Governing system: in accordance with ISO 3046-4.
- .2 Governor with following features:
 - .1 Electronic type, electric actuator, speed droop externally adjustable from isochronous to five percent (5%), temperature compensated with steady state speed maintenance capability of plus or minus 0.25%.

2.10 STARTING SYSTEM

- .1 Provide complete starting system including cranking starting motor, batteries, battery stand, heavy-duty battery cables, and battery charger.
- .2 Provide positive engaging type cranking motor. Cranking motor and flywheel ring gear arrangements which may permit tooth to tooth abutment not acceptable.
- .3 Lead acid, 12 VDC storage battery with sufficient capacity to crank engine for one (1) minute at 15°C without using more than twenty-five percent (25%) of ampere hour capacity.
- .4 Battery charger: constant voltage, solid state, two (2) stage from trickle charge at standby to boost charge after use. Regulation: plus or minus one percent (1%) output for plus or minus 10% input variation. Automatic boost for six (6) hours every thirty (30) days. Equipped with DC voltmeter, DC ammeter and on-off switch. Minimum charger capacity: 10 A.
- .5 Provide necessary heavy duty, maintenance-free battery cables and connectors.
 - .1 Select cable wire size on the basis of allowing not more than five percent (5%) voltage drop at time of peak load.
 - .2 Cable length sufficient to allow battery location on either side of engine.

2.11 GENERATOR

- .1 Provide generator, drip proof, single bearing and close coupled to engine with SAE housing: to NEMA MG1.
 - .1 Generator: full amortisseur winding, direct connected brushless exciter with easily removable bolt-on diodes with surge protection.
- .2 Output at 40°C ambient:

- .1 One hundred percent (100%) full load continuously
- .2 One hundred and ten percent (110%) full load for one (1) hour
- .3 One hundred and fifty percent (150%) full load for one (1) minute
- .3 Revolving field, brushless, single bearing
- .4 Drip proof
- .5 Amortisseur windings
- .6 Synchronous type
- .7 Dynamically balanced rotor permanently aligned to engine by flexible disc coupling
- .8 Exciter :permanent magnet
- .9 EEMAC H insulation on windings
- .10 Temperature rise 130°C standby
- .11 Voltage regulator: thyristor controlled rectifiers with phase controlled sensing circuit:
 - .1 Stability: one percent (1%) maximum voltage variation at any constant load from no load to full load
 - .2 Regulation: two percent (2%) maximum voltage deviation between no load steady state and full load steady state.
 - .3 Transient: thirty percent (30%) maximum voltage dip on one step application of 0.8PF full load
 - .4 Transient: ten percent (10%) maximum voltage rise on one step removal of 0.8PF full load
 - .5 Transient: 5 s maximum voltage recovery time with application or removal of 0.8PF full load
- .12 Alternator: capable of sustaining three hundred percent (300%) rated current for period not less than 10s permitting selective tripping of down line protective devices when short circuit occurs.
- .13 Maximum deviation of open circuit terminal voltage waveform not to exceed five percent (5%).

2.12 PANEL - GENERAL

- .1 Totally enclosed, alternator mounted.
- .2 Instruments:
 - .1 Digital one hundred percent (100%) solid state circuitry indicating type two percent (2 %) accuracy, rectangular face, flush panel mounting:
 - .1 Voltmeter: ac, scale 0 to 1000 V, 3 Phase (L-L & L-N)
 - .2 Ammeter: ac, scale 0 to 200 A, (3 Phase & total)

- .3 Frequency meter: scale 55 to 65Hz
- .4 kVA, Total
- .5 kVAR, Total
- .6 kW.h, Total
- .7 kVAR.h, Total
- .8 PF, average total & per phase
- .9 DC voltage
- .10 Coolant temperature
- .11 Oil pressure
- .12 RPM
- .13 Hours run
- .14 System diagnostic
- .2 All functions to be selected by keypad.
- .3 Instrument Transformers
 - .1 Potential dry type for indoor use:
 - .1 Ratio: 600 to 120
 - .2 Rating: 600 V, 60Hz, BIL 10 kV
 - .2 Current dry type for indoor use:
 - .1 Ratio: as required
 - .2 Rating: 600 V, 60Hz, BIL 10 kV
 - .3 Positive action automatic short circuiting device in secondary terminals
- .3 Controls:
 - .1 Engine start button
 - .2 Selector switch: Off Auto Manual - Test (at full load or test at no load)
 - .3 Engine emergency stop button and provision for remote emergency stop button
 - .4 Alternator output breaker:
 - .1 Circuit breaker: bolt on, moulded case, temperature compensated for 40°C ambient, dual thermal magnetic trip.
 - .5 Voltage control rheostat: mounted on inside of control panel.
 - .6 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
 - .7 Solid state indicator lights for alarm, according to CSA-C282, with one (1) set manually reset NO/NC contacts wired to terminal block for remote annunciation on:
 - .1 Low engine temperature
 - .2 Low battery voltage
 - .3 Ventilation failure

- .4 Low coolant level
- .5 Automatic transfer switch in bypass mode
- .8 Solid state NFPA 110 compliant controller for automatic shutdown and alarms, according to CSA-C282, with one (1) set manually reset NO/NC contacts wired to terminal block for remote annunciation on:
 - .1 Engine overcrank
 - .2 Engine overspeed
 - .3 Engine high temperature
 - .4 Engine low lube oil pressure
 - .5 Short circuit
 - .6 AC over voltage
 - .7 Control switch not in auto
- .9 Lamp test button.
- .10 Provision for remote monitoring.

2.13 WORKMANSHIP

- .1 Manufacture and construct equipment free from blemishes, defects, burrs and sharp edges; accuracy of dimensions and marking of parts and assemblies; thoroughness of welding, brazing, painting and wiring, alignment of parts and tightness of assembly screws and bolts.

2.14 QUALITY CONTROL

- .1 General: before acceptance, assemble and set up the unit, complete with specified equipment, for tests at the supplier's plant:
 - .1 Ensure tests are witnessed by the Contract Administrator on mutually agreed date.
 - .2 Provide suitable test area with adjustable loading facilities.
 - .3 Ensure that engine has run in sufficiently prior to load test, test forms completed, system debugged and recorders connected.
- .2 Product examination: complete mechanical and electrical examination to determine compliance with specification and drawings with respect to materials, workmanship, dimensions, and marking.
- .3 Non-operational tests and checks: perform following test and checks before starting the unit:
 - .1 Shaft alignment, end float, angular and parallel
 - .2 Cold resistance of generator windings
 - .3 Belt tensioning
 - .4 Equipment grounds
 - .5 Electrical wiring
 - .6 All grease lubricating points
 - .7 Personnel safety guards
 - .8 Air cleaner

- .9 Coolant
- .10 Lubricating oil type and level
- .11 Type of fuel
- .12 Vibration isolator adjustment
- .13 Temperature and pressure sensors
- .14 Engine exhaust system
- .15 Tools
- .16 Spares
- .4 Operation test and check: on completion of non-operational tests and checks, start unit cold. Provide multi-channel recorder and record following:
 - .1 Time for unit to start and reach settled voltage and frequency
 - .2 Time from initiation of start to full load application, with voltage and frequency settled
 - .3 Voltage and frequency transient and steady state limits for full load to no load, 3/4 load to no load, 1/2 load to no load, 1/4 load to no load and vice versa. Measure machine vibration levels under the same load conditions, in accordance with Section [26 32 12 - Diesel Electric Generating Units Appendix B Factory Test]
 - .4 Record battery voltage drop during cranking
- .5 Protection and control demonstration: on completion of operation test and check, demonstrate following:
 - .1 Overheat protection
 - .2 Low oil pressure protection
 - .3 Cranking cut out
 - .4 Overcrank protection (three (3) tries)
 - .5 Overspeed protection
 - .6 Under and over frequency
 - .7 Under and over voltage
 - .8 Electrical fault protection:
 - .1 Failure to close breaker
 - .2 Failure to build up voltage
 - .3 Generator short circuit and overcurrent
 - .9 All control functions.
- .6 Load tests: load test the unit for four (4) hours at full rated load and in ambient room temperature of 40° C. Take following data at start of load test and every one (1) hour interval thereafter:
 - .1 Frequency
 - .2 Voltage
 - .3 Current
 - .4 Kilowatts
 - .5 Generator winding temperature

- .6 Generator frame temperature
- .7 Engine coolant temperature
- .8 Oil temperature and pressure
- .9 Manifold pressure
- .10 Ambient room temperature
- .11 Generator cooling air outlet temperature
- .12 Exciter field current and voltage
- .13 Vibration displacement
- .14 Ambient air temperature inside panel with all doors closed
- .7 Voltage and frequency regulation tests: on completion of load tests take hot resistance reading of generator windings.
 - .1 Subject the unit to hot voltage and frequency regulation tests for full load to no load, 3/4 load to no load, 1/2 load to no load, 1/4 load to no load and vice versa.
- .8 Additional tests: perform tests, consistent with contract, which Contract Administrator may require to satisfy adequacy and satisfactory operation of the unit.
- .9 Record test data on manufacturers' test forms and be complete with diagrams and description of test results, deficiencies and corrective action.
 - .1 Ensure test data sheets signed by supplier.

2.15 ACCEPTABLE MANUFACTURERS

- .1 Kohler, or approved equal

Part 3 Execution

3.1 INSTALLATION

- .1 Installation by others.
- .2 Provide installation, start-up, and commissioning assistance to the installation contractor.

3.2 TRAINING

- .1 Provide demonstration and training.

END OF SECTION

Approved: 2003-12-31

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 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Section 26 05 00 - Common Work Results - Electrical.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN3-C13, Instrument Transformers
 - .2 CSA C22.2No.5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE)
 - .3 CSA C22.2No.178, Automatic Transfer Switches
- .2 American National Standards Institute (ANSI)/National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA ICS 2, 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 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 (1) phase below pre-set 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.

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: kW
 - .2 Ballast lamp load: kW
 - .3 Motor load: kW
 - .4 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 starting and transfer to standby unit and back to normal power
 - .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 manual specified in Section 01 78 00 - Closeout Submittals.
- .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 CIRCUIT BREAKER TYPE TRANSFER EQUIPMENT

- .1 Circuit Breaker Type Transfer Equipment: to CSA C22.2No.5.
- .2 Rated: 600 V, 60Hz, 200 A, 4 wire, solid neutral.
 - .1 Fault withstand rating: 35 kA symmetrical for 3 cycles with maximum peak value of 35 kA.

- .2 One (1) normal-three phase molded-case circuit breaker with magnetic trip, mounted on common base, designed for double throw action, motor operated, mechanically held and interlocked, floor or wall mounted CSA Type twelve (12) enclosure.
- .3 One (1) emergency – three phase moulded-case circuit breaker with magnetic trip, motor operated, and interlocked.
- .4 Circuit breakers:
 - .1 Trip free in closed position
 - .2 Interrupting rating: 35 A symmetrical
- .5 Dead front construction with access to relays and controls for inspection and maintenance, and manual operating lever for transfer switch.
- .6 Auxiliary contact: to initiate emergency generator start-up on failure of normal power.
- .7 Solid copper neutral bar, rated: 200 A.

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.
 - .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 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: three (3) phase for normal power and on one (1) phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2V minimum undervoltage and over voltage protection.
 - .2 Time delay: normal power to standby, adjustable solid state, 0 to 60s.
 - .3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 0 to 60s.
 - .4 Time delay on retransfer from standby to normal power, adjustable 0 to 60s.
 - .5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, in twenty (20) second intervals to ten (10) minutes.
 - .6 Time delay during transfer to stop transfer action in neutral position to prevent fast transfer, adjustable, 5s intervals to 180s.

- .7 Frequency sensing, to prevent transfer from normal power 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 power availability normal and standby, switch position, green for normal, red for standby, mounted in panel.
- .2 Auxiliary relay to provide 2 N.O. and 2 N.C. contacts for remote alarms.

2.5 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 4 nameplates
 - .2 For meters, indicating lights, minor controls: size 2 nameplates

2.6 SOURCE QUALITY CONTROL

- .1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Contract Administrator
- .2 Notify Contract Administrator seven (7) days in advance of date of factory test.
- .3 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

Part 3 Execution

3.1 INSTALLATION

- .1 Installation by others.
- .2 Provide installation, start-up, and commissioning assistance to the installation contractor.

3.2 TRAINING

- .1 Provide demonstration and training.
- .2 Assist installation contractor in installation, start-up and commissioning of the transfer equipment.
- .3 Program transfer equipment for desired operation.
- .4 Provide Check relays and solid state monitors and adjust as required.
- .5 Install and connect battery and remote alarms.

3.3 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.
- .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.
- .7 Repeat, at one (1) hour intervals, four (4) times, complete test with selector switch in each position, for each test.

END OF SECTION