PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

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.

.3 Language operating requirements: provide identification nameplates and labels for control items in English and French.

.4 Use one nameplate or label for both languages.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Shop drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.2 Quality Control:
.1 Provide CSA certified equipment and material.
.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
.3 Submit test results of installed electrical systems and instrumentation.
.4 Permits and fees: in accordance with General Conditions of contract.
.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

1.5 QUALITY ASSURANCE

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.

.2 Separate waste materials for reuse and recycling.

1.7 SYSTEM STARTUP

.1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 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 will aspects of its care and operation.

1.8 OPERATING INSTRUCTIONS

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:
.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
.3 Safety precautions.
.4 Procedures to be followed in event of equipment failure.
.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.2 Factory assemble control panels and component assemblies.

2.2 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and Departmental Representative.

2.3 WIRING TERMINATIONS

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

2.4 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels.

.2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.5 Terminal cabinets and pull boxes: indicate system and voltage.

2.5 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered 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.

2.6 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

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 CONDUIT AND CABLE INSTALLATION

.1 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 FIELD QUALITY CONTROL

.1 Conduct following tests:
.1 Systems: communications.

.2 Carry out tests in presence of Departmental Representative.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.5 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

PART 1 - GENERAL

1.1 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide shop drawings:
.1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.

PART 2 - PRODUCTS

2.1 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure or molded PVC.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on turned edge covers.

.4 Environment rating as indicated on the drawings.

PART 3 - EXECUTION

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00-Common Work Results for Electrical.

.2 Identification Labels: indicate system name voltage and phase.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
.1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittal.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

2.2 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double lock nuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.4 Vacuum clean interior of outlet boxes before installation of wiring devices.

.5 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

.1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.3 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.
.1 Two hole steel straps for conduits larger than 50 mm.

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

2.5 FISH CORD

.1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Use rigid galvanized steel threaded conduit as indicated.

.3 Use rigid pvc conduit in secure areas.

.4 Minimum conduit size for power circuits: 19 mm.

.5 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.6 Mechanically bend steel conduit over 19 mm diameter.

.7 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.8 Remove and replace blocked conduit sections.

3.2 INSTALLATION (Cont'd)

.8 (Cont'd)

.1 Do not use liquids to clean out conduits.

.9 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not pass conduits through structural members except as indicated.

3.4 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.5 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.4 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect cables from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan Waste Reduction Workplan.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.
.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously, where applicable.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.6 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

.1 Where markers are removed to permit installation of additional cables, reinstall existing markers.

3.4 FIELD QUALITY CONTROL

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

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

.3 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.4 Pre-acceptance tests:

3.4 FIELD QUALITY CONTROL (Cont'd)

.4 (Cont'd)

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.5 Acceptance Tests:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing at% of original factory test voltage in accordance with manufacturer's ICEA recommendations.

.4 Leakage Current Testing:

.1 Raise voltage in steps from zero to maximum values as specified by ICEA manufacturer for type of cable being tested.

.2 Hold maximum voltage for a time period specified by ICEA manufacturer.

.3 Record leakage current at each step.

.6 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.5 CLEANING

.1 Progress Cleaning:

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management: separate waste materials for reuse and recycling.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION .1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).

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

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION