

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International).
.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
.2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
.3 CSA Z462-2012, Workplace Electrical Safety.
- 1.2 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 unless noted otherwise.
- 1.3 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 co-ordinated 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.
.4 Submit necessary number of copies of drawings to inspection authorities.
.5 If changes are required, notify Departmental Representative of these changes.

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- 1.3 SUBMITTALS
(Cont'd)
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- .3 Quality Control: in accordance with Section 01 10 10 - General Instructions.
- .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .3 Factory assemble control panels and component assemblies.
 - .4 Use new equipment and materials unless otherwise specified.
 - .5 Submit test results of installed electrical systems and instrumentation.
 - .6 Permits and fees: in accordance with General Conditions of Contract.
 - .7 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .8 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .4 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.
- 1.4 QUALITY ASSURANCE
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- .1 Quality Assurance: in accordance with Section 01 10 10 - General Instructions.
- .2 Qualifications: electrical work to be carried out by qualified, licensed electricians or apprentices 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 The work of this division is to be carried out by a contractor who holds a valid electrical contractors license as issued by the Province of Newfoundland and Labrador.
- .3 Site Meetings:
- .1 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, as required.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.
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1.5 DELIVERY,
STORAGE AND
HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 10 10 - General Instructions.

1.6 HOUSEKEEPING
PADS AND ANCHOR
BOLTS

- .1 All floor mounted equipment shall be installed on 100 mm high concrete housekeeping pads. All house keeping pads shall have chamfered edge and 50mm larger than equipment dimensions all around.
- .2 Equipment supports supplied by equipment manufacturer are specified elsewhere in Electrical Division.
- .3 Fabricate equipment supports not supplied by equipment manufacturer from structural grade steel.
- .4 Supply anchor bolts and templates for installation by other divisions.

1.7 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service representative to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 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.

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.

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| <u>1.8 OPERATING INSTRUCTIONS</u>
(Cont'd) | .2 | (Cont'd) |
| | .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 | Print or engrave operating instructions and frame under glass or in approved laminated plastic. |
| | .4 | Post instructions where directed. |

PART 2 - PRODUCTS

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| <u>2.1 MATERIALS AND EQUIPMENT</u> | .1 | Provide material and equipment in accordance with Section 01 10 10 - General Instructions. |
| | .2 | Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS. |
| | .3 | Factory assemble control panels and component assemblies. |
| <u>2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS</u> | .1 | Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated. |
| | .2 | Control wiring and conduit shall comply with requirements of Division 26 for standard of quality. |
| <u>2.3 WARNING SIGNS</u> | .1 | Warning Signs: in accordance with requirements of inspection authorities . |
| | .2 | Decal signs, minimum size 175 x 250 mm. |

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2.4 OPERATION AND
MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual to be approved by, and final copies deposited with Departmental Representative before final inspection.
- .3 Operation data to include:
 - .1 Description and operation of each system.
 - .2 Operating instructions for each system.
- .4 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble shooting instructions for each system and item of equipment.
 - .2 Data to include schedule of tasks frequency and tools required.

2.5 WIRING
TERMINATIONS

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

2.6 EQUIPMENT
IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet , 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

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2.6 EQUIPMENT
IDENTIFICATION
(Cont'd)

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING
IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, 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 communications cables, matched throughout system.

2.8 CONDUIT AND
CABLE
IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

2.8 CONDUIT AND CABLE
IDENTIFICATION
(Cont'd)

.3 Colours:(Cont'd)

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Communication	Green	
Fire Alarm	Red	
CCTV	White	
Emergency	Red	Blue

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

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.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.
- .2 Ensure that manufacturer's registration plates are properly affixed to all apparatus showing the size, name of equipment, serial number and all information usually provided, including voltage, cycle, phase and the name and address of the manufacturer.
- .3 Do not paint over registration plates or approval labels. Leave openings through insulation for viewing the plates. Contractors or sub-contractors nameplate are not acceptable.

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3.3 CONDUIT AND
CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.
- .4 Where cable tray or conduit routes are shown on drawings, the contractor must follow as closely as possible the routing shown. Before running conduits or cable trays in locations other than as shown, coordinate with Departmental Representative and other trades on site.

3.4 LOCATION OF
OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall: allow minimum 150 mm horizontal clearance between boxes.
- .3 Change locations of outlets at no extra cost or credit, providing distance does not exceed 300 mm, and information is given before installation.
- .4 Locate light switched on latch side of doors.
- .5 When locating outlets, receptacles, switches and devices in architectural finishes such as millwork, always refer to the appropriate architectural details and associated shop drawings before roughing in. When in doubt about location of devices, coordinate with the Departmental Representative before roughing in.

3.5 MOUNTING
HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

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3.5 MOUNTING HEIGHTS (Cont'd)	.3	Install electrical equipment at following heights unless indicated otherwise. .1 Local switches: 1200 mm. .2 Wall receptacles: .1 General: 400 mm. .2 Above top of continuous baseboard heater: 200 mm. .3 Above top of counters or counter splash backs: 175 mm. .4 In mechanical rooms: 1200 mm. .3 Panelboards: as required by Code or as indicated. .4 Telephone and data outlets: 400 mm. .5 Wall mounted telephone outlets: 1200mm. .6 Fire alarm stations: 1200 mm. .7 Fire alarm horn/strobes: 2400 mm. .8 Television outlets: 400 mm. .9 Wall mounted speakers: 2400 mm. .10 Clocks: 2400 mm. .11 Thermostats: 1200 mm. .12 Exit Lights: 2400 mm. .13 Emergency battery units: 2400mm.
3.6 CO-ORDINATION OF PROTECTIVE DEVICES	.1	Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
3.7 FIELD QUALITY CONTROL	.1	Load Balance: .1 Measure phase current to panelboards with normal loads operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes. .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment. .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards and dry-core transformers operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
	.2	Conduct following tests in accordance with Section 01 10 10 - General Instructions. .1 Power distribution system including phasing, voltage, grounding and load balancing. .2 Circuits originating from branch distribution panels. .3 Lighting and its control.

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- 3.7 FIELD QUALITY CONTROL
(Cont'd)
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- .2 (Cont'd)
.4 Heating and its control.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 Manufacturer's Field Services:
.1 Obtain 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 PART 1 - SUBMITTALS.
.2 Provide manufacturer's field services consisting of periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- 3.8 CLEANING
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- .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.
- 3.9 FIREPROOFING
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- .1 Where cables, conduits or cable trays pass through fire rated walls or ceilings, sleeve and steel conduit and install fire and smoke seal to the requirements of the National Building of Canada.
- .2 Acceptable Product: Nelson CLK self-levelling firestop sealant. For cable trays, use Nelson type PLW sealant.
- .3 Fire/Smoke seal systems shall be installed in accordance with manufacturer's recommended practice by a licensed installation technician.
- 3.10 EXITING CONDITIONS
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- .1 Contractor to visit site before tender to determine details of existing conditions. No extra will be allowed for items that a proper field visit would have shown as necessary.
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| 3.10 EXITING
CONDITIONS
(Cont'd) | .2 | Make connections to existing conditions at times approved by Owner. Request written approval of time when connections can be made. |
| | .3 | Be responsible for damage to existing systems and equipment. |
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| 3.11 ELECTRICAL
DRAWINGS | .1 | The design drawings are partly diagrammatic and intended to convey that scope of work and indicated the general arrangement of systems and components. They should not be constructed as, or otherwise understood to be, fabrication drawings. |
| | .2 | The drawings are not intended to show structural details or architectural features. |
| | .3 | Do not determine locations of equipment and materials by measurement from drawings. |
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| 3.12 ACCESS DOORS | .1 | Supply access doors for concealed electrical equipment to allow operation. inspection, adjusting and servicing. |
| | .2 | Use flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. |
| | .3 | Material:
.1 Use stainless steel with brushed satin or polished finish in special areas such as tiled or marble surfaces and as directed by Departmental Representative.
.2 In remaining areas, use prime coated steel.
.3 Use ULC rated access doors in fire rated walls and ceilings. |
| | .4 | Installation:
.1 Locate so that concealed items are accessible.
.2 Locate so that hand or body entry (as applicable) is achieved.
.3 Installation is specified in applicable sections. |
| | .5 | Acceptable manufacturers: Buensod, Le Hage, Zurn. |
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3.13 CUTTING AND
PATCHING

- .1 Install work in such a manner and at such time as will require a minimum of cutting and patching of the building structure.
- .2 Holes in exposed locations, in or through existing floors, shall be drilled and smoothed by sanding, Use of jackhammer will not be permitted. Holes shall only be cored in locations specifically approved by the Departmental Representative.
- .3 Holes through masonry walls to accommodate sleeves shall be made with an iron pipe masonry core saw.
- .4 Do not core or cut concrete floors without special permission from the Departmental Representative.

3.14 MAINTENANCE
MATERIALS AND
SPECIAL TOOLS

- .1 Furnish spare parts as outlined in the appropriate specification section.
- .2 Provide special tools to service equipment as recommended by manufacturer and as outlined in appropriate specification section.

3.15 DISCREPANCIES
AND ERRORS

- .1 The contractor shall check all drawings furnished him immediately upon their receipt and shall promptly notify the Departmental Representative of any discrepancies or errors. The contractor shall compare all drawings and verify the figures before laying out the work and shall be responsible for any errors which might have been avoided thereby.
- .2 The contractor shall, before fabricating or installing any materials or equipment, carefully check all drawings to ensure that such materials or equipment can be installed without conflicting with the structural elements of the building, or with the work of other trades. Where, in his opinion, the work cannot be installed as shown on the Departmental Representative's drawings, the contractor shall not proceed with the work affected thereby until the necessary revisions have been made or specific instructions issued by the Departmental Representative. The Owner shall not be responsible for any extra costs incurred by the contractor as a result of his failure to comply with this requirement of the specifications.
- .3 Should the contractor, at any time, discover any discrepancies or errors in the drawings or

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3.15 DISCREPANCIES .3
AND ERRORS
(Cont'd)

(Cont'd)
specifications, or any lack of dimensions or other information, he shall report the same at once to the Departmental Representative for correction or instructions, and shall not proceed with the work affected hereby until such correction has been made or the necessary instructions issued by the Departmental Representative.

3.16 APPROVAL OF .1
ALTERNATES

"Acceptable Alternates" means that products of the manufacturers given are the only acceptable products to be used on the project.

- .2 "Standard of Acceptance" means that the product named meets with the specifications in all regards and that the products of other acceptable manufacturers must have the same features and capacities.
- .3 Where reference is made to a materials standard and no acceptable material or manufacturer is listed, products are acceptable provided they are certified as meeting the reference standards.
- .4 Manufacturers, their agents or contractors supplying alternative products to be considered for acceptance shall submit written applications to the Departmental Representative.
- .5 Acceptance of alternates does not absolve Electrical Division from making all necessary adjustments to the work of other trades incurred by selection of alternative equipment or materials. Such adjustments are to be made at no additional cost to the Owner.