

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Drawings and general provisions of the contract, including the general requirements of Division 01, apply to this Section.

1.02 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-F2010, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.
 - .2 CAN3-C235-F83, 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 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.

1.03 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.

1.04 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Language operating requirements: provide identification nameplates and labels for control items in English and French.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for review fire alarm riser diagram, plan and zoning of building under plexiglass in glazed frames at fire alarm control panel and annunciator.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec of Canada.
 - .2 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.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 Submit by sending PDF drawings and technical data at Departmental Representative.

- .6 If changes are required, notify Departmental Representative of these changes before they are made.
- .4 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Provide CSA certified equipment and material.
 - .2 Permits and fees: in accordance with the General Provisions of the contract.
 - .3 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.06 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 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, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Upon completion of Work, after cleaning is carried out.

1.07 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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.08 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 engineer 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.

1.09 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 Safety precautions.

- .3 Procedures to be followed in event of equipment failure.
- .4 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.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.10 RECOVERY OF REMOVED COMPONENTS

- .1 Parks Canada will be able to retrieve the components of the fire alarm system. The components are, but are not limited to: fire alarm panels, smoke detectors, strobes and horns. Components must be dismantled with care to permit re-use as replacement equipment where possible and temporarily stored on the site at the time of collection by the Parks Canada representative.

2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified or other accredited body.
- .3 Factory assemble control panels and component assemblies.

2.02 WIRING TERMINATIONS

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

2.03 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet white plate, black letters 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 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 Terminal cabinets and pull boxes: indicate system and voltage.
- .7 Transformers: indicate capacity, primary and secondary voltages.

2.04 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.

2.05 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.

	Prime	Auxiliary
Up to 250 V	Yellow	
Up to 600 V	Yellow	Green
Up to 5 kV	Yellow	Blue
Up to 15 kV	Yellow	Red
Telephone	Green	
Other communication	Green	Bleu
Systems fire alarm	Red	
Emergency voice	Red	Bleu
Other security systems	Red	Yellow

2.06 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 outdoor electrical equipment.

3 EXECUTION

3.01 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Quebec construction code, chapter 5, 2010 ed.

3.02 NAMEPLATES AND LABELS

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

3.03 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.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: see legend or indications on drawings.
 - .2 Wall receptacles:
 - .1 General: see legend or indications on drawings.
 - .2 Above top of continuous baseboard heater: see legend or indications on drawings.
 - .3 Above top of counters or counter splash backs: see legend or indications on drawings.
 - .4 In mechanical rooms: see legend or indications on drawings.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: see legend or indications on drawings.
 - .5 Wall mounted telephone and interphone outlets: see legend or indications on drawings.
 - .6 Fire alarm stations: see legend or indications on drawings.
 - .7 Fire alarm bells: see legend or indications on drawings.

3.04 FIELD QUALITY CONTROL

- .1 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Systems: fire alarm system.
 - .2 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .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.
- .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 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, as directed in PART 1 - QUALITY ASSURANCE.

3.05 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

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Drawings and general provisions of the contract, including the general requirements of Division 01, apply to this Section.
- .2 Section 26 05 00.
- .3 Section 26 05 21.

1.02 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.18-F98(C2013), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2 No.65-F93(C2013), Wire Connectors.
- .2 National Electrical Manufacturers Association (NEMA)

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Divert unused wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

2 PRODUCTS

2.01 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper or aluminum sized to fit copper or aluminum conductors as required.
- .2 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

3 EXECUTION

3.01 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Drawings and general provisions of the contract, including the general requirements of Division 01, apply to this Section.
- .2 Section 26 05 00.
- .3 Section 26 05 20.

1.02 REFERENCES

- .1 CSA C22.2 no 0.3-9(R2014).

1.03 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2 PRODUCTS

2.01 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V and 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.

2.02 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Connectors: anti short connectors.

3 EXECUTION

3.01 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

- .3 Perform tests before energizing electrical system.

3.02 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.
- .3 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .4 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

3.03 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 In underground conduits, as indicated.

3.04 INSTALLATION OF ARMOURED CABLES

- .1 Installation only in the roof spaces not open to the public. Refer to section 26 05 34 of these specifications regarding installation at other locations.
- .2 Group cables wherever possible on channels.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Drawings and general provisions of the contract, including the general requirements of Division 01, apply to this Section.

1.02 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-F98(C2013), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-FM1981(C2013), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-F13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-FM1985(C2013), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-FM1984(C2013), Rigid PVC (Unplasticized) Conduit.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Datasheets: submit documents and samples required in accordance with Section 01 33 00 - / samples to be submitted.

1.04 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste according to Section 01 74 21 - Construction / Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.

2 PRODUCTS

2.01 CONDUITS

- .1 Molding system: in accordance with CSA C22.2 standard number 62-F93 (C2013), in aluminum, colour as selected by the Departmental Representative, provided complete with the elbows, tees, support trims and conduit accessories required in order to ensure complete installation.
- .2 Rigid metal conduits: in accordance with the CSA C22.2 no. 45 standard, in aluminium, with threaded connectors, watertight in accordance with section 22 of CEQ standard C22.10-10 for environments with excessive moisture content.

2.02 CONDUIT FASTENINGS

- .1 One holed aluminum straps to secure surface conduits 50mm and smaller.
 - .1 Two hole aluminum straps for conduits larger than 50 mm.
- .2 Aluminum beam clamps to secure conduits to exposed steel work.
- .3 Channel type aluminum supports for two or more conduits at 2.5 m on centre.
- .4 Threaded aluminum rods, 6 mm in diameter, to support suspended channels.

2.03 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory aluminum "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight aluminum connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.04 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Weatherproof expansion fittings for linear expansion at entry to panel.

2.05 FISH CORD

- .1 Polypropylene, tension strength : 5 KN.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

- .1 Use a molding system in the spaces open to the public in buildings 19, 32 and 100.
- .2 Use rigid metal conduits, which will be installed with aluminum screws under all of the buildings, in the spaces open to the public in Building 29, and in mechanical equipment and technical rooms.
- .3 Minimum conduit size for lighting and power circuits: 21 mm.
- .4 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .5 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .6 Install fish cord in empty conduits.
- .7 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .8 Dry conduits out before installing wire.

3.03 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.

- .2 Run conduits in flanged portion of structural steel or wood.
- .3 Group conduits wherever possible on suspended surface channels.
- .4 Do not pass conduits through structural members except as indicated.

3.04 CONDUITS UNDERGROUND (IF REQUIRED)

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.05 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION