PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

.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, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

.4 Underwriters Laboratories of Canada (ULC)
  .1 CAN/ULC S537-13, Verification of Fire Alarm Systems.

1.3 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.

1.4 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 to damage equipment.

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

.4 Use one nameplate or label for each language.

.5 Coordinate work with mechanical contractor to avoid interference.

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings:
- .1 Submit shop drawings with contractor's stamp to indicate acceptance and conformance to installation requirements.
- .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 shop drawings and product data electronically to Departmental Representative for review of conformance to design intent.
- .6 If changes are required, notify Departmental Representative of these changes before they are made.

.3 Quality Control: in accordance with Section 01 45 00 - 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 inspection authorities 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 shop drawings and product data electronically to Departmental Representative for review of conformance to design intent.
- .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.4 Manufacturer's Field Reports: submit to Departmental Representative'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.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license 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 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 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 Waste Management Plan.

1.8 SYSTEM STARTUP

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

1.9 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.

1.10 MODIFICATIONS TO FIRE ALARM SYSTEM

.1 Where work requires modifications to or interruption of fire alarms systems:
- .1 Retain services of building fire alarm maintenance contractor for fire alarm systems on a daily basis, isolate and protect all devices relating to:
  - .1 modification of fire alarms systems; and/or
  - .2 cutting, welding, soldering or other construction activities which might activate fire alarm system.

.2 Immediately upon completion of work, restore fire alarm systems to normal operation and verify that all devices are fully operational.

.3 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.

.4 Provide verification report at completion of work in accordance with CAN/ULC S537.

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 inspection authorities before delivery to site and submit such approval as described in PART 1.5 - 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 Decal signs, minimum size 175 x 250 mm.

2.3 WIRING TERMINATIONS

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

2.4 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 (or to match building standard), lettering accurately aligned and engraved into core mechanical attached with self tapping screws.
  .2 Sizes as follows:

NAMEPLATE SIZES

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: self-adhesive, electronically printed, 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 .

.5 Nameplates for junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.

.7 Disconnects, splitters & panels: indicate equipment power source and voltage.

.8 Pull boxes: indicate system and voltage.

.9 Receptacles and switches: Labels to indicate panel and circuit number.

2.5 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered 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 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

2.7 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 "equipment green" finish to EEMAC Y1-1.
- .2 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.

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 Sleeves through concrete: 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.

3.4 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 to 'barrier-free code' requirements unless indicated otherwise.
- .1 Local switches: 1100 mm.
- .2 Wall receptacles:
  - .1 General: 400 mm.
  - .2 Above top of counters or counter splash backs: 175 mm.

.3 In mechanical rooms: 1400 mm.
.3 Panelboards: as required by Code or as indicated.
.4 Telephone and interphone outlets: 400 mm.
.5 Fire alarm stations: 1200 mm.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.6 FIELD QUALITY CONTROL

.1 Load Balance:
.1 Measure phase current to panelboards affected by the work with normal loads (lighting) operating at between time of acceptance; adjust branch circuit connections as required to obtain best balance of current phases for new and existing loads and record changes. phases for new and existing loads and record changes.
.2 Provide upon completion of work, load balance report as directed in PART 1 ACTION AND INFORMATIONAL SUBMITTALS: phase and neutral currents on panelboards affected by the work, 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 45 00 - Quality Control.
.1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
.2 Circuits originating from branch distribution panels.
.3 Motors and associated control equipment including sequenced operation of systems where applicable.

.3 Carry out tests in presence of Departmental Representative.

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

.5 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. 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.

3.7 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.

3.8 DEMOLITION

.1 Unless otherwise noted, materials for removal become the contractor's property and shall be taken from site, and disposed of in accordance with all applicable codes, standards and regulations.

.2 Disconnect and make safe all systems to be demolished including panels, feeders, branch circuits and equipment by other divisions. Coordinate with other divisions.

.3 Maintain existing remaining circuits, systems, etc., which pass through area of construction. Provide necessary components to maintain systems. Ensure components will be concealed when construction is complete.

.4 Reinstate immediately any remaining existing systems that are inadvertently interrupted during construction.

.5 Remove redundant conduit and wiring back to source unless otherwise noted, and make safe.

.6 Devices from demolition are not to be reused unless noted otherwise.

.7 All fire alarm devices to remain in operation. Protect smoke detectors from dust exposure during construction.

.8 Ensure fire alarm system is operational at the end of each shift.

.9 After demolition work is complete and prior to proceeding with new work, notify the departmental representative for inspection.

.10 Include a cost to remove and relocate twenty-four (24) junction boxes, and associated wiring and conduit due to new wall construction.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

.1 Section 26 05 21 - Wire and Cables (0-1000 V).

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- .2 CSA C22.2 No. 65-13, Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No. 65, with current carrying parts of copper alloy sized to fit copper conductors as required.

.2 Clamps or connectors for armoured cable and flexible conduit as required to: CAN/CSA-C22.2 No. 18.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:
- .1 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

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 00 10 - General Instructions.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG (6 mm^2) and larger. Minimum size: 12 AWG (4 mm^2).

.2 Copper conductors: size as indicated, with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

2.2 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.

.5 AC90 (BX) may be used in removable ceilings and metal partition walls, maximum length 3 metres.

PART 3 - EXECUTION

3.1 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 Install minimum #12 AWG green insulated ground wire in all conduits used for power or lighting circuit.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Grounding conductors: bare stranded copper, tinned, soft annealed, size as required.

.2 Insulated grounding conductors: green, copper conductors, size as required.

.3 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Make grounding connections in radial configuration only, with connections terminating at single grounding point . Avoid loop connections.

.8 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.9 Ground secondary service pedestals.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.3 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall as indicated.

.2 Ground items of electrical equipment to ground bus with individual bare stranded copper connections size #6 AWG.

3.4 FIELD QUALITY CONTROL

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

.2 Perform ground continuity and resistance 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.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 - GENERAL

1.1 NOT USED

.1 Not used.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted and suspended.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.

.2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.3 Fasten exposed conduit or cables to building construction or support system using straps.
- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.4 Suspended support systems.
- .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.5 For surface mounting of two or more conduits use channels at 3 m on centre spacing.

.6 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.8 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.9 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

.10 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.11 Paint cut ends of threaded rads with zinc rust inhibiting paint.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 01 00 10 - General Instructions.

PART 2 - PRODUCTS

2.1 SPLITTERS

.1 Construction: Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers flush mounted: 25 mm minimum extension all around.

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 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 pull boxes so as not to exceed 30 m of conduit run or three 90° bends between pull boxes.

3.3 IDENTIFICATION

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

.2 Identification labels: Size 2 indicating voltage and phase.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

1.2 SUBMITTALS

.1 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

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

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 Extension and plaster rings for flush mounting devices in finished walls.

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 35 mm and pull boxes for larger conduits.

.4 Double locknuts 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 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

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

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

.6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated A Hardware, National Standard of Canada.
- .2 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.

PART 2 - PRODUCTS

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings with expanded ends.

.2 Flexible metal conduit: to CSA C22.2 No. 56, steel liquid-tight flexible metal.

2.2 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 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 3 m on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

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

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Steel connectors and couplings for EMT. Set screw type.

2.4 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 Conceal conduits except in mechanical and electrical service rooms.

.3 Use electrical metallic tubing (EMT) except where otherwise indicated.

.4 Use flexible metal conduit for connection to motors in dry areas.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.6 Minimum conduit size for power circuits: 21 mm.

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

.8 Mechanically bend steel conduit over 21 mm diameter.

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

.10 Install fish cord in empty conduits.

.11 Remove and replace blocked conduit sections.
  .1 Do not use liquids to clean out conduits.

.12 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

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

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 DEFINITIONS

.1 SRS: acronym for Seismic Restraint System.

1.3 GENERAL DESCRIPTION

.1 This section covers design, supply and installation of complete SRS for all systems, equipment specified for installation on this project. This includes electrical light fixtures, conduit, electrical equipment and systems, both vibration isolated and statically supported.

.2 SRS to be fully integrated into, compatible with:
- .1 Noise and vibration controls specified elsewhere in this project specification.
- .2 Structural, mechanical, electrical design of project.

.3 During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.

.4 Design to be by Professional Engineer specializing in design of SRS and registered in province of Ontario. Division 26 to include all costs associated with this work as it relates to Division 26 installations. Submit design sketches c/w professional stamp prior to start of installations, c/w installation requirements.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Submittals to include:
- .1 Full details of design criteria.

.3 Submit additional copy of shop drawings and product data to Structural Engineer for review of connection points to building structure.

1.5 MAINTENANCE DATA

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 26 05 00 - Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 SRS MANUFACTURER

.1 SRS to be from one manufacturer regularly engaged in production of same.

2.2 GENERAL

.1 SRS to provide gentle and steady cushioning action and avoid high impact loads

.2 SRS to restrain seismic forces in all directions.

.3 Fasteners and attachment points to resist same load as seismic restraints.

.4 SRS of conduit systems to be compatible with:
- .1 Expansion, anchoring and guiding requirements.
- .2 Equipment vibration isolation and equipment SRS.

.5 SRS utilizing cast iron, threaded pipe, other brittle materials not permitted.

.6 Attachments to RC structure:
- .1 Use high strength mechanical expansion anchors.
- .2 Drilled or power driven anchors not permitted.

.7 Seismic control measures not to interfere with integrity of firestopping.

2.3 SRS FOR STATIC EQUIPMENT, SYSTEMS

.1 Floor-mounted equipment, systems:
- .1 Anchor equipment to equipment supports.
- .2 Anchor equipment supports to structure.
- .3 Use size of bolts scheduled in approved shop drawings.

.2 Suspended equipment, systems:
- .1 Use one or combination of following methods:
  - .1 Install tight to structure.
  - .2 Cross-brace in all directions.
  - .3 Brace back to structure.
  - .4 Slack cable restraint system.
- .2 SRS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.
- .3 Hanger rods to withstand compressive loading and buckling.

2.4 SRS FOR VIBRATION ISOLATED EQUIPMENT

.1 Floor mounted equipment, systems:
- .1 Use one or combination of following methods:
  - .1 Vibration isolators with built-in snubbers.
  - .2 Vibration isolators and separate snubbers.

.3 Built-up snubber system approved by Engineer, consisting of structural elements and elastomeric layer.

.2 SRS to resist complete isolator unloading.

.3 SRS not to jeopardize noise and vibration isolation systems. Provide 4-8 mm clearance between seismic restraint snubbers and equipment during normal operation of equipment and systems.

.4 Cushioning action to be gentle and steady by utilizing elastomeric material or other means in order to avoid high impact loads.

.2 Suspended equipment, systems:

.1 Use one or combination of following methods:

.1 Slack cable restraint system.

.2 Brace back to structure via vibration isolators and snubbers.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Attachment points and fasteners:

.1 To withstand same maximum load that seismic restraint is to resist and in all directions.

.2 Install SRS at least 25 mm from all other equipment, systems, services.

.3 Miscellaneous equipment not vibration-isolated:

.1 Bolt through house-keeping pad to structure.

.4 Co-ordinate connections with all disciplines.

3.2 INSPECTION AND CERTIFICATION

.1 SRS to be inspected and certified by Manufacturer upon completion of installation.

.2 Seismic Design Engineer shall provide written report to Departmental Representative certifying that SRS has been installed in accordance with the SRS drawings. The report shall bear the seal and signature of the SRS Design Engineer.

3.3 COMMISSIONING DOCUMENTATION

.1 Upon completion and acceptance of certification, hand over to Departmental Representative complete set of construction documents, revised to show "as-built" conditions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

.1 CSA International
  .1 CSA C9-02 (R2016), Dry-Type Transformers.

.2 National Electrical Manufacturers Association (NEMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for dry type transformers and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 - PRODUCTS

2.1 DESIGN DESCRIPTION

.1 Design.
  .1 Type: ANN.
  .2 3 phase, kVA as indicated, 600 V input, 120/208 V output, 60 Hz.
  .3 Voltage taps: standard.
  .4 Insulation: Class H, 150 degrees C temperature rise.
  .5 Basic Impulse Level (BIL): standard.
  .6 Hipot: standard.
  .7 Average sound level: standard
  .8 Impedance at 17 degrees C: standard
  .9 Enclosure: NEMA, removable metal front panel.
  .10 Mounting: wall.
  .11 Finish: in accordance with Section 26 05 00 - Common Work Results for Electrical .
  .12 Copper windings.
  .13 Winding configuration to be as noted on drawings.
  .14 Voltage Regulation to be 4% or better.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Label size: 7.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Mount dry type transformers up to 75 kVA as indicated.

.2 Mount dry type transformers above 75 kVA on floor.

.3 Ensure adequate clearance around transformer for ventilation.

.4 Install transformers in level upright position.

.5 Remove shipping supports only after transformer is installed and just before putting into service.

.6 Loosen isolation pad bolts until no compression is visible.

.7 Make primary and secondary connections in accordance with wiring diagram.

.8 Energize transformers after installation is complete.

.9 Make conduit entry into bottom 1/3 of transformer enclosure.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by dry type transformers installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.2 REFERENCES

.1 CSA International
- .1 CSA C22.2 No. 29-2015, Panelboards and Enclosed Panelboards.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No .29 and product of one manufacturer.
- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Minimum of 2 flush locks for each panel board.

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with neutral of same ampere rating of mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked enamel as per colour schedule.

.11 Sprinkler proof enclosure.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard. Plywood backboard shall be painted with fire retardant paint.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA-C22.2 No. 42-10 (R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CAN/CSA C22.2 No. 42.1-13, Cover Plates for Flush-Mounted Wiring Devices.
- .3 CSA C22.2 No. 55-15, Special Use Switches.
- .4 CSA C22.2 No. 111-10 (R2015), General-use Snap Switches.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 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.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

PART 2 - PRODUCTS

2.1 SWITCHES

.1 20 A, 120 V, single pole switches to: CSA-C22.2 No. 55 and CSA-C22.2 No. 111.

.2 Manually-operated general purpose ac switches with following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine moulding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 White toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads. Rated 120V, 20A.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No. 42 with following features:
- .1 White nylon face moulded housing, Decora style.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Triple wipe contacts and riveted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
- .1 White urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with CSA configuration, ampacity and voltage as indicated. Specification grade, nylon face, white.

.4 Receptacles of one manufacturer throughout project.

.5 Self-contained with 15 A, 120 V circuit interrupter and white duplex receptacle complete with:
- .1 Solid state ground sensing device.
- .2 Facility for testing and reset.

2.3 SPECIAL WIRING DEVICES

.1 Wall Mounted Occupancy Sensor Switches: Dual technology passive infrared and ultrasonic to turn lights off after adjustable time delay. Tamperproof for programming manual "on" and automatic "off" at 5-30 minute delay. Automatically adjusts time delay for usage pattern. Automatic audible/visual alerts/light sensor with adjustable sensitivity, vandal resistant lens.

.2 Wall mounted 120V line voltage dimmer switch that is compatible with new LED lighting fixtures.

.3 Ceiling Mounted Occupancy Sensors:
- .1 Dual technology passive infrared and ultrasonic to turn lights off after adjustable time delay (5-30 minutes). Operating voltage: 347 and/or 120 VAC, 60 Hz; high sensitivity; load: 0-1500 W ballast and LED, 1/6 ZHP motor load.

2.4 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No. 42.1.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel, 1 mm thick cover plates cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.7 Weatherproof spring-loaded cover plates complete with gaskets for single receptacles or switches.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Switches:
- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Install switches in gang type outlet box when more than one switch is required in one location.
- .3 Mount switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical as indicated.

.2 Receptacles:
- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles at height in accordance with Section 26 05 00 for Common Work Results for Electrical as indicated.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:
- .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.4 Motion sensor switch adjustments:
- .1 Set motion sensor programming switches for Manual On/Automatic Off, 15 minute time delay off, Light sensitivity to midrange, SmartSet On, walk-thru mode On, audible alert On.
- .2 Provide min. 3 hours manufacturer training for typical set up.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA C22.2 No. 5-16, Molded-case Circuit Breakers, Molded-case Switches and Circuit-breaker Enclosures.

1.2 SUBMITTALS

.1 Prior to any installation of circuit breakers in either a new or existing installation, Contractor must submit three (3) copies of a certificate of origin, from the manufacturer, duly signed by the factory and the local manufacturer's representative, certifying that all circuit breakers come from this manufacturer, they are new and they meet standards and regulations. These certificates must be submitted to the Departmental Representative for approval.

.2 A delay in the production of the certificate of origin won't justify any extension of the contract: and additional compensation.

.3 Any work of manufacturing, assembly or installation should begin only after acceptance of the certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate the manufacturer listed on circuit breakers to authenticate all new circuit breakers under the contract, and that, to Contractor's expense.

.4 In general, the certificate of origin must contain:
- .1 The name and address of the manufacturer and the person responsible for authentication. The responsible person must sign and date the certificate;
- .2 The name and address of the licensed dealer and the person of the distributor responsible for the Contractor's account.
- .3 The name and address of the Contractor and the person responsible for the project.
- .4 The name and address of the local manufacturer's representative. The local representative must sign and date the certificate.
- .5 The name and address of the building where circuit breakers will be installed:
  - .1 Project title.
  - .2 End user's reference number.
  - .3 The list of circuit breakers.

.5 Submit product data in accordance with Section 01 33 00 -Submittal Procedures.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5.

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

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers over 60 A to have minimum 35,000 A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers in existing panelboards as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

.1 CSA Group
  .1 CSA C22.2 No. 4-16, Enclosed and Dead-Front Switches.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Non-fusible, disconnect switch in CSA enclosure, to CSA C22.2 No. 4 size as indicated.

.2 Provision for padlocking in off switch position by three (3) locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Quick-make, quick-break action.

.5 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

.1 International Electrotechnical Commission (IEC)
  .1 IEC 947-4-1-2002, Part 4: Electromechanical contactors and motor-starters.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Starters: to IEC 947-4 with AC4 utilization category.

2.2 MANUAL MOTOR STARTERS

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
  .1 Switching mechanism, quick make and break.
  .2 One overload heater, manual reset, trip indicating handle.

.2 Accessories:
  .1 Toggle switch: heavy duty labelled as indicated.
  .2 Indicating light: heavy duty type and colour as indicated.
  .3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install starters and control devices in accordance with manufacturer's instructions.

.2 Install and wire starters and controls as indicated.

.3 Confirm motor nameplate and adjust overload device to suit.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA).

.2 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 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 complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative . efficient.
- .3 Photometric data to include: spacing criterion, coefficient of utilization table, luminaire

.3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
- .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and.

1.4 QUALITY ASSURANCE

.1 Provide one initial in standalone of every fixture type for review on site of mounting details, orientation, aiming and lamping, prior to continuing with balance of fixture installation. Provide power to fixture for initial installation.

1.5 DELIVERY, STORAGE AND HAN

.1 Deliver, store and handle materials in accordance with project schedule.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates paddling and packaging materials.

.4 Divert unused metal materials from landfill to metal recycling facility.

.5 Disposal and recycling of fluorescent lamps as per local regulations.

.6 Disposal of old PCB filled ballasts.

1.6 PROOF OF ORDER

.1 Contractor to provide a proof of order via copy of purchase order or other suitable document from supplier, within 4 weeks of approval of shop drawings.

PART 2 - PRODUCTS

2.1 LED FIXTURES

.1 Except as otherwise indicated, provide LED luminaires, of type and size indicated on fixture schedules.

.2 Including the following features unless otherwise indicated:
- .1 Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
- .2 Each luminaire shall be rated for a minimum operational life of 50,000 hours utilizing a maximum ambient temperature of (25°C).
- .3 Light Emitting Diodes tested under LM-80 standards for a minimum 12,000 hours.
- .4 Colour Rendering Index (CRI) of 80 at a minimum.
- .5 Colour temperature as per fixture schedule.
- .6 Rated lumen maintenance at 70% lumen output for 50,000 hours, unless otherwise indicated.
- .7 5 year luminaire warranty, minimum.

2.2 DRIVERS

.1 Electronic driver for LED fixtures: Comply with UL 1310 Class 2 requirements for dry and damp locations. Include the following features unless otherwise indicated:
- .1 Rated for 50,000 hours of life or greater, unless otherwise noted.
- .2 Sound rating: Class A.
- .3 Total Harmonic Distortion Rating: 20 percent or less.
- .4 Current Crest Factor: 1.5 or less.
- .5 0-10V dimming standard.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in Lighting Fixture Schedule.

2.5 LUMINAIRES

.1 As indicated in Lighting Fixture Schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:
  .1 Install flexible or rigid conduit for luminaires.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

.1 Clean all fixtures, housings lamps, reflectors & lenses (in area of work) with clean damp cloth prior to final acceptance.

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 05 21 - Wires and Cables (0-1000 V).

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCE STANDARDS

.1 CSA International
- .1 CSA C22.2 No. 141-15, Emergency Lighting Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 WARRANTY

.1 For batteries in this Section 26 52 00 - Emergency Lighting, 12 months warranty period is extended to 120 months.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Emergency lighting equipment: to CSA C22.2 No. 141.

.2 Supply voltage: 120 V, AC.

.3 Output voltage: 12 V DC.

.4 Operating time: 30 minutes at rated load c/w 10% spare capacity.

.5 Battery: sealed, maintenance free, long life.

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.

.10 Lamp heads: integral on unit, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: quartz halogen 12V MR16, 100 hr. die cast had, glare free, sealed beam.

.11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.12 Finish: White.

.13 Auxiliary equipment:
- .1 Ammeter.
- .2 Voltmeter.
- .3 Test switch.
- .4 Time delay relay.
- .5 Battery disconnect device.
- .6 AC input and DC output terminal blocks inside cabinet.
- .7 Bracket.
- .8 Cord and single twist-lock plug connection for AC.
- .9 RFI suppressors.

2.2 WIRING OF REMOTE HEADS

.1 Conduit: type EMT, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Conductors: RW90 type in accordance with Section 26 05 21 - Wires and Cables (0-1000 V), sized in accordance with manufacturer's recommendations, minimum #10 AWG size to account for voltage drop.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Connect exit lights to unit equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 00 10 - General Instructions.

.2 Section 01 14 25 - Designated Substance Report.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.2 No. 141-15, Unit Equipment for Emergency Lighting.
- .2 CSA C860-11 (R2016), Performance of Internally-Lighted Exit Signs.

.2 National Research Council Canada
- .1 NRCC NBCC-2015, National Building Code of Canada 2015.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

PART 2 - PRODUCTS

2.1 STANDARD UNITS

.1 Exit lights: to CSA C22.2 No. 141 and CSA C860.

.2 Housing: slim-profile extruded aluminum, brushed aluminum finish.

.3 Face and back plates: extruded aluminum.

.4 Lamps: LED with 25-year rated life.

.5 Pictogram: aluminum frame, opal diffuser panel, pictogram panel with multiple films for direction selection, and clear protective panel. Pictogram panel shall consist of green pictogram and white graphic symbol meeting the visibility specifications referred to in ISO 3864-1, and conform to the dimensions indicated in ISO 7010.

.6 Suitable for 347V or 120V normal supply and emergency supply.

.7 Die cast mounting bracket for universal surface wall, ceiling, or end mounting as indicated.

.8 Provide circuit labels at all exit signs.

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 exit lights to manufacturer's recommendations, listing requirements, NBCC-2010 and local regulatory requirements.

.2 Connect fixtures to exit light circuits.

.3 Connect emergency lamp sockets to emergency circuits.

.4 Ensure that exit light circuit breaker is locked in on position.

3.3 CLEANING

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

END OF SECTION