

1 General

1.1 GENERAL

- .1 This section covers items common to Sections of Division 26 - Electrical. This section supplements requirements of Division 1 - General Requirements.

1.2 CODES AND STANDARDS

- .1 Comply with the requirements of following codes and standards:
- .1 Pertinent CSA and ULC Standards.
 - .2 Canadian Electrical Code, Part 1 - 2021.
 - .3 CSA C235:19 - Preferred Voltage Levels for AC Systems up to 50,000 V.
 - .4 National Building Code, 2015.
 - .5 National Fire Code of Canada, 2015.
 - .6 Requirements of authorities having jurisdiction.

1.3 CARE, OPERATION AND START-UP

- .1 Instruct Departmental Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service personnel 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 all aspects of its care and operation.

1.4 VOLTAGE RATINGS

- .1 Operating voltages: to CSA C235:19.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 DESIGN REQUIREMENTS

- .1 The drawings and these specifications are complementary to each other and what is called for by one shall be binding as if called for by both.
- .2 Drawings for the electrical work are, in part, diagrammatic and indicate the general arrangement of equipment and outlets.

- .3 The drawings, which form an integral part of this contract, shall serve as the working drawings. They indicate the general layout of the complete electrical system, arrangement of feeders, circuits, outlets, switches, controls, panelboards, distribution centres, fixtures and other work. The drawings indicate the general location and routes to be followed, but do not show all conduit and/or wiring or all the structural, mechanical and architectural details. Plan and install conduit runs respecting all applicable conditions including structural, mechanical and architectural details. Check for the locations of all expansion/building joints and ensure that all electrical installations at or crossing these locations are as detailed and as required to compensate for the possible movement at the joint.
- .4 Before carrying out the work verify that there are no apparent obstructions or interferences. Changes to the work made necessary by failure to make this verification will not be considered for extra payment.
- .5 Coordinate the locations of outlets with architectural and structural details and elevations as well as millwork and pertinent furniture layouts, etc.
- .6 The location of equipment or outlets may be changed by the Departmental Representative at any time prior to installation, within a radius of 3 metres from the location shown on the drawings, at no extra cost to the Contract.

1.6 SCOPE OF WORK

- .1 This Work includes, but is not limited to, the supply and installation of supervision, labour, permits, equipment, materials, and consumables necessary to provide this facility with complete and operational systems as listed below, as indicated on drawings, and as described in the specifications.
 - .1 Disconnection and demolition of electrical wiring devices and connections to mechanical equipment being removed or relocated.
 - .2 Supply and installation of new electrical equipment as indicated, including but not limited to lighting fixtures, lighting controls, radiant ceiling heating panels, thermostats, and associated raceways, wiring, and device boxes as required.
 - .3 Installation and wiring of equipment supplied by others including but not limited to barrier free door operator hardware and emergency call devices, hand dryers, washroom fixture electrical connections, and associated raceways, wiring, and device boxes as required.

1.7 SUBMITTALS

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

- .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 Submit certificate of acceptance from relevant Governmental Authorities upon completion of work to Departmental Representative.
- .4 Manufacturer's Field Reports: submit manufacturer's written report to Departmental Representative, within 3 days of review, verifying compliance of work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.
 - .1 Submit as-built drawings and maintenance manuals.

1.8 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 or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Health and Safety Requirements: Construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Execution Date.
- .2 Construction Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 1 - General Requirements.

1.10 SYSTEM START-UP

- .1 Instruct the 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, 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.

1.11 OPERATING INSTRUCTIONS

- .1 Provide French and English 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 the following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start-up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 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.
- 2 Products
- 2.1 MATERIALS AND EQUIPMENT
- .1 Provide material and equipment in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from Governmental Authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
 - .3 Factory assembled control panels and component assemblies.
- 2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS
- .1 Verify installation and coordination responsibilities related to motors, equipment and controls, as indicated. Verify size, location and wiring requirements of all equipment with appropriate trade and reviewed shop drawings prior to rough-in.
 - .2 Provide control wiring and conduit except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and shown only on mechanical drawings prepared as part of existing design.
- 2.3 WARNING SIGNS
- .1 Warning Signs: in accordance with Applicable Law.
 - .2 Decal signs, minimum size 175 x 250 mm.
- 2.4 WIRING TERMINATIONS
- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

- .1 All junction and/or pull boxes shall be marked with an indelible ink marker to designate the circuit number of enclosed wiring, the designated panel name and electrical characteristics where applicable.
- .2 Identification of wiring devices and other equipment shall be completed to match existing standards used in the building.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings indicating panel and circuit number black and white tapes. Normal ground circuits to have ground, neutral and phase wires identified with black on white background tape. Tape to be preprinted vinyl, self-adhesive. Circuits to be identified at both ends and at all pull and junction boxes.
- .2 Use colored plastic tapes to identify feeders on both ends of phase conductors and of junction and pull boxes if conductor insulation colors are other than red, black, blue, white and green.
- .3 Maintain phase sequence and colour coding throughout.
- .4 Colour code: to CSA C22.1-2021.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables to existing standards used in the building.
- .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 MANUFACTURERS AND CSA LABELS

- .1 Visible and legible, after equipment is installed.

2.9 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 location of outlets at no extra cost or credit, providing distance does not exceed 3 m, and information is given before installation.
- .4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

2.10 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centre line 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: 1050 mm.
 - .2 Wall receptacles:
 - .1 General: 500 mm.
- 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 FIELD QUALITY CONTROL
 - .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
 - .2 The work of this Division to be carried out by a contractor who holds a valid Electrical contractor license as issued by the Province that the work is being constructed.
 - .3 Conduct and pay for the tests listed below which are presented in detail in the relevant Division 26 - Electrical specification section that follows:
 - .1 Circuits originating from branch distribution panels.
 - .2 Lighting and its control.
 - .3 Heaters and associated control equipment including sequenced operation of systems where applicable.
 - .4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
 - .5 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.
 - .6 Carry out tests in presence of Departmental Representative and others as required.
 - .7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
 - .8 Submit test results for Departmental Representative's review as required.
- 3.4 COORDINATION OF PROTECTIVE DEVICES
 - .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.5 ACCESSORIES

- .1 Where not specifically indicated, provide standard accessory items or materials such as equipment supports, brackets, channels, protection, etc., to make a complete and satisfactory installation.

3.6 ACCESS DOORS

- .1 Provide access doors for electrical equipment, junction boxes and controls, as required to provide access for servicing and maintenance. Supply access doors for placing by trade whose work these panels are installed in.
- .2 Coordinate the location of all outlet/junction/pull boxes, and other concealed equipment requiring access so as to minimize the need for access doors. Where access doors become necessary, coordinate the size, quantity and location with the Departmental Representative before installation.
- .3 Doors to be flush, 450 x 450 mm to items in 600 mm deep ceilings and 450 x 600 mm to items in ceilings deeper than 600 mm. Doors shall open 180°, have rounded safety corners, concealed continuous piano hinges and anchor straps. All steel to be perma-coated. Doors to be of approved manufacture with published literature.
- .4 Access doors to be fire rated to match walls or ceilings which form part of a fire rated enclosure or barrier.

3.7 COORDINATION

- .1 Cooperate and coordinate with other Divisions as required for a satisfactory and expeditious completion of work. Coordinate locations of conduits, raceways, junction and pullboxes, etc., with Mechanical trade as well as other pertinent trades.
- .2 Instruct and supervise those trades doing related work.

3.8 PROTECTION

- .1 Take precautions to protect personnel on the job site from injury due to live equipment and circuits. Shield and clearly mark all such circuits or equipment "DANGER - LIVE 208 VOLTS" or the applicable voltage.

3.9 CLEANING

- .1 Do final cleaning in accordance with the General Conditions and, specifically, as follows:
 - .1 Clean lighting fixture reflectors, lamps, lenses and other lighting surfaces that have been exposed to construction dust and dirt.
 - .2 Clean and touch-up surfaces of shop-painted equipment scratched or marred during shipment or installation to match the original paint.
 - .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
 - .4 Remove debris and vacuum clean within panelboard tubs, device boxes and electric heating fixtures.
- .2 Remove electrical waste and debris from the site.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA).
 - .1 CSA C22.2 No.0.3-01 (R2005), Test Methods for Electrical Wires and Cables.

2 Products

2.1 BUILDING WIRES

- .1 Conductors: copper, stranded for #10 AWG and larger.
- .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
- .3 Minimum cable size for power and lighting is #12 AWG solid copper.
- .4 Wire size to 120 V receptacles to be increased to sized according to the following table to reduce voltage drop.

	#12	#10	#8
15A Circuit	24m	39m	62m
20A Circuit	18m	29m	46m

2.2 ARMOURED CABLES

- .1 Conductors: insulated, copper size as indicated.
- .2 Type: AC90 - lead sheath over cable assembly and under armour.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Provide anti-short insulators at each termination of armour.

2.3 CONTROL CABLES

- .1 Type LVT: number of soft annealed copper conductors, sized as indicated mini size #18 AWG, with thermoplastic insulation, outer covering of thermoplastic jacket, FT-4 rated.
- .2 Low energy 300 V control cable: solid or stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40°C TWH polyethylene insulation with shielding of tape coated with paramagnetic material over each pair and over all conductors and overall covering of PVC jackets.
- .3 Controls contractor to refer to Section 26 05 00 - Common Work Results for Electrical, Article 2.7, Conduit and Cable Identification.

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 Minimum size conductors allowable for branch wiring to be #12 AWG insulated copper.

- .2 Contractor to install wiring keeping the shortest length of wire run between panel and load possible in order to reduce voltage drop. Voltage drop at loads not to exceed requirements of Canadian Electrical Code 2021. Wire size to be increased as required to comply.
 - .3 All power wiring to be installed in conduit.
- 3.2 INSTALLATION OF CONTROL CABLES
- .1 Install control cables as indicated.
 - .2 Ground control cable shield.
- 3.3 INSTALLATION OF ARMOURED CABLES
- .1 Install cables grouped together on channels where possible.
 - .2 Acceptable only for use for final 1.5 m of connection to light fixtures.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA).
 - .1 CSA C22.1-2021, Canadian Electrical Code, Part 1.

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 for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel 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.
- .2 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster and tile walls.

2.3 CONDUIT BOXES

- .1 Cast FS or FD ferralloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.4 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats or uninsulated connectors with plastic bushings.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

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. Reducing washers are not allowed.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA).
 - .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
 - .2 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .3 CSA C22.2 No. 83.1-04, Electrical Metallic Tubing.

2 Products

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, M1981 (R1999) galvanized steel threaded.
 - .1 Couplings: Threaded rigid galvanized steel.
 - .2 Bushings: Insulated throat, grounding type. All connections shall be threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.1-04 with couplings.
- .3 Flexible metal conduit: to CSA C22.2 No. 56-04 aluminum and liquid-tight flexible metal.
- .4 Colour to confirm to 26 05 00 Electrical General Requirements, Article 2.7 Conduit and Cable Identification.

2.2 CONDUIT FASTENINGS

- .1 One-hole steel straps to secure surface conduits 50 mm and smaller. 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 1.5 m oc.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.
- .5 Perforated steel strapping, tie wire and/or field fabricated hangers or supports will not be permitted.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Miscellaneous fittings: Locknuts, bushings, reducers, chase nipples, 3-piece unions, split couplings, plug and expansion fittings specifically designed for their particular application.
- .4 Provide set screw type steel fittings.

3 Execution

3.1 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 and in unfinished areas.
- .3 Use electrical metallic tubing (EMT) except in cast concrete and in locations subject to mechanical injury and where specified otherwise.
- .4 Minimum conduit size for branch wiring to be 16 mm.
- .5 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .6 Mechanically bend steel conduit over 21 mm diameter.
- .7 Install a green insulated copper ground wire in all conduits. #12 AWG shall be the smallest acceptable ground.
- .8 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .9 A maximum length of 1.5 m of flexible metal conduit or AC-90 12/2 shall be allowed for light fixture drops.

3.2 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 suspended or 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.

3.3 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 42-99 (R2004), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No. 42-1-04, Cover Plates for Flush-Mounted Wiring Devices (B1-National Standard, with UL 514D).
 - .3 CSA-C22.2 No. 111-18, General-Use Snap Switches.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

2 Products

2.1 OCCUPANCY SENSOR SWITCH

- .1 15A, 120V, dual technology occupancy sensor.
- .2 Occupancy sensor shall have the following features:
 - .1 Auto-on / auto-off, manual-on / manual-off
 - .2 Dual technology: ultrasonic and passive infrared.
 - .3 Retrigger feature such that detection by either technology shall retrigger the lighting system within 5 seconds.
 - .4 Adjustable time delay of 5 to 30 minutes configured by on board DIP switch.
 - .5 Built in LED indicator light to verify device is functioning.
- .3 Five-year warranty.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:
 - .1 Suitable for No. 10 AWG for back and side wiring.
 - .2 Break-off links for use as split receptacles.
 - .3 Eight back wired entrances, four side wiring screws.
 - .4 Triple wipe contacts and riveted grounding contacts.
 - .5 Commercial specification grade.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one (1) manufacturer throughout project.

2.3 COVER PLATES

- .1 Cover plates to be high impact resistant polycarbonate.
- .2 White color. To match device.
- .3 Cover plates from one (1) manufacturer throughout project.
- .4 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

3 Execution

3.1 INSTALLATION

.1 Occupancy Sensor Switch:

- .1 Install switches in gang type outlet box when more than one (1) switch is required in one (1) location.
- .2 Mount switches at height specified in Section 26 05 00 - Common Work Results for Electrical.
- .3 Calibrate sensor time delays and sensitivity for proper detection of occupants and energy savings.

.2 Receptacles:

- .1 Install receptacles in gang type outlet box when more than one (1) receptacle is required in one (1) location.
- .2 Mount receptacles at height specified in Section 26 05 00 - Common Work Results for Electrical.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .4 To be mounted with ground contact at the top if mounted vertically or to the left if mounted horizontally.

.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.

END OF SECTION

1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Provide submittals to the Departmental Representative in an orderly sequence in accordance with Section 01 33 00 - Submittal Procedures. Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by the Departmental Representative.

1.2 REFERENCE STANDARDS

- .1 Installation to conform to CEC Section 30, Part 1.
- .2 UL8750 Standard for LED Equipment for Use in Lighting Products.
- .3 IES LM-80-20 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules.

2 Products

2.1 LUMINAIRES

- .1 Type "A" – Recessed 610mm x 1220mm LED troffer.
 - .1 3,700 nominal lumens, 3500K, 80 CRI, 120V.
 - .2 Maximum overall thickness: 120 mm.
 - .3 Commercial grade.
 - .4 Rated LED life 50,000 hours L70.
 - .5 Five-year LED and driver warranty.
- .2 Type "V" Wall Mounted 610mm Linear LED Vanity Light.
 - .1 Downlight output: 800 nominal lumens, 3500K, 90 CRI, 120V.
 - .2 Wall direct mounting.
 - .3 Finish: White.
 - .4 Commercial grade.
 - .5 Rated LED life 50,000 hours L70.
 - .6 Five-year LED and driver warranty.

2.2 CONTROLS

- .1 Contractor is responsible for providing controls which are compatible with switching functions and luminaires as indicated.
- .2 Install system as per manufacturer's instructions.
- .3 The Contractor shall commission and make adjustments to system and all sensors to the satisfaction of the Departmental Representative. This shall include, but not be limited to, calibration of the system lux/ dimming percentage range, photocell response time, closed loop (ambient light sensing) operation, switching behavior.
- .4 The Contractor shall provide, at the facility, training to familiarize personnel with the operation, use, adjustment, and problem-solving diagnosis of the system.

2.3 LED LIGHT SOURCE (LIGHT ENGINE)

- .1 LED Light engine(s) to have a minimum lifetime of 50,000 hours at 40°C and have a minimum efficiency of 80 lumens per watt.
- .2 LED's shall be tested in accordance with IES LM-80-08 standards.

2.4 POWER SUPPLY UNITS (DRIVERS)

- .1 Luminaires shall be equipped with an LED driver(s) that accept the voltage as indicated on the Fixture Schedule. Individual drivers shall be replaceable.
- .2 Driver(s) shall be UL8750 class 2 listed for their intended purpose.
- .3 Driver(s) shall have a minimum efficiency of 85%.
- .4 Driver(s) shall reliably start at minimum ambient temperatures from -40°C to 40°C with THD of $\leq 10\%$.

3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Install Type 'V' vanity light centred above vanity. Coordinate final mounting height and location with others.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Directly for all luminaire designs.
 - .2 Luminaire wiring to be #12 AWG unless otherwise indicated.
 - .3 All wiring to be done to Canadian Electrical Code C22.1-21.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling or support luminaires from ceiling grid in accordance with local inspection requirements.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 46-13 (R2018) - Electric Air-Heaters.

1.2 DESCRIPTION OF SYSTEM

- .1 Supply and installation of new radiant ceiling heating panels and low voltage thermostats as indicated on contract drawings.
- .2 Devices, components and systems shall be fully compatible with one another and with existing electric heating system.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

2 Products

2.1 RADIANT CEILING HEATING PANELS

- .1 525 W, 208 V, 610 mm x 1220 mm radiant ceiling heating panel to: CSA-C22.2 46-13.
- .2 Front panel finish: high-temperature baked-on powder coating, white.
- .3 Electrical junction box attached to back of panel, with cover and internal pigtail wires.
- .4 Maximum overall thickness: 120 mm.

2.2 THERMOSTAT (LOW VOLTAGE)

- .1 For use with existing heater relay panel control circuit.
- .2 Temperature setting range: 10 °C to 25 °C.
- .3 Colour: white.
- .4 Moulded plastic finish.

3 Execution

3.1 INSTALLATION

- .1 Install panels and accessories in accordance with manufacturer's instructions, approved shop drawings, and CEC 2021.
- .2 Locate radiant ceiling heating panels and thermostat controls where indicated.
- .3 Connect to power supply and control wiring.
- .4 Test installed panels at rated voltage using ammeter. Ensure that ammeter values are same as calculated for heating load.

END OF SECTION