

Part 1 General

1.1 GENERAL

- .1 This Section covers items common to Sections 26, 27 & 28. This section supplements requirements of Section 01.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1-2012 latest edition where specified otherwise.

1.3 DRAWINGS AND SPECIFICATIONS

- .1 Before submitting bid and commencing work, check drawings and specifications of other trades for conflicts with the electrical work, if such conflicts exist, obtain a ruling from the Engineer as to what adjustments are to be made before proceeding. Carefully examine the site and ascertain all related conditions, and verify all dimensions.
- .2 Should any discrepancy appear between the electrical drawings and the specifications which leaves the trade in doubt as to the true intent and meaning of the drawings and specifications, obtain a ruling from the Engineer before submitting a tender. If this is not done, it will be assumed the more expensive alternative has been allowed.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings to the Engineer for all major electrical equipment.
- .2 All light fixture shop drawings shall be submitted at once. Each of the sets shall be arranged with fixtures in numerical order.
- .3 All shop drawings shall be originals. Faxes and photocopies will be rejected. Each set of shop drawings shall contain information pertinent to this project. All accessories, options, mounting hardware, etc. shall be highlighted or clearly identified on each shop drawing. All shop drawings shall be reviewed and stamped by the electrical contractor. Non-compliant shop drawings will be rejected.

1.5 MAINTENANCE MANUALS AND AS-BUILT DRAWINGS

- .1 Compile and submit to the departmental representative four (4) sets of paper and digital maintenance manuals. Each manual shall contain shop drawings for all major electrical equipment, a list of suppliers providing components, original factory manuals, name and address of contractors, test results and certificates. Manuals shall be bound in blue 3 ring binders with project name, address and date of completion embossed in white on the binding and the cover.
- .2 Provide the departmental representative with as-built drawings detailing electrical systems as installed, including all addenda, change orders and field orders. As-built drawings shall be supplied in digital format as well as paper copy.

1.6 CARE, OPERATION, START-UP, AND TRAINING

- .1 Instruct Consultant 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 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 all aspects of its care and operation.
- .4 Where systems require programming, provide initial programming to allow system to operate in all functional modes. As part of training demonstrate how to make changes to all programmable functions and modes. Refer to individual specification sections for further training requirements.
- .5 Contractor shall arrange and pay for digital audio/video recording of all training sessions. Upon completion of all training sessions, provide three (3) complete sets of recorded training sessions on DVD. Recording and playback formats shall be compatible with all standard PC's or DVD players. Arrange all files in an easy to read, logical format using a menu system.
- .6 Training sessions shall be attended by owners personnel and the consultant. Training sessions shall be arranged a minimum of 10 working day in advance. The contractor shall direct the training session and training shall be provided by the manufacturers representative. Contractor shall provide an attendance sheet which shall be completed by all individuals present at the training session. The attendance sheet shall indicate the system being demonstrated, the name of the contractor, the name and qualifications of the manufacturers representative, the date of the session, the names and positions of the owners personnel, the names and positions of the consultants and the project name.

1.7 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83 (R2010).
- .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.

1.8 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.

- .3 Consultant will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify Consultant of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to Consultant.

1.9 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .3 Factory assemble control panels and component assemblies.

1.10 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Supplier and installer responsibility is indicated in Mechanical Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .2 Control wiring and conduit, regardless of voltage, is supplied, installed and tested by the Mechanical Contractor.

1.11 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.12 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:

.2 Nameplates:

- .1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

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

- .3 Labels: Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .4 Wording on nameplates and labels to be approved by Consultant prior to manufacture.
- .5 Allow for average of twenty-five (25) letters per nameplate and label.
- .6 Identification to be English.
- .7 Use one nameplate or label.
- .8 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .9 Identify equipment with Size 3 labels engraved "ASSET INVENTORY No.____". Number as and if directed by Engineer.
- .10 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .11 Terminal cabinets and pull boxes: indicate system and voltage.
- .12 Transformers: indicate capacity, primary and secondary voltages and feeder origin
- .13 Each panel shall be supplied with a directory card holder welded to inside of door, complete with a neatly typewritten list showing information as follows:
 PANEL BOARD NAME.....B
 PANEL CIRCUIT.....120/208 VOLTS

CIRCUIT NUMBER	DESCRIPTION	LOAD
1	LIGHTING ROOM 100	1200 WATTS
2	RECEPTACLES ROOM 100	6-15 AMPS
3	ROOM 220 EXHAUST FAN	500 WATTS

- .14 Receptacle Identification:
- .1 Provide size 1 lamacoid label indicating circuit number(s) (ie. 2A-21) on each receptacle coverplate.
 - .2 Emergency receptacles hall have red lamicoid labels instead of black

1.13 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or 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 code: to latest edition of CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.
- .5 Branch circuit wiring at all receptacles shall be labelled with circuit number (ie. 2A-21) using slide-on, collar type identifiers with factory numbering. Use black lettering on white background.

1.14 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
Voice	Green	
Data	Green	Blue
Fire Alarm	Red	
Nurse Call	Red	Blue
Security Systems	Red	Yellow

- .1 Identify conduits, boxes and metallic sheathed cables except for branch circuit conduits less than 25mm.
- .2 Identification shall consist of self adhesive printed labels, white label with minimum 20mm black lettering.
- .3 Identify all junction boxes on the side and on the cover.

- .4 Identify conduits at 10m intervals and/or in every room.
- .5 Identify conduits and boxes such that labeling is clearly visible from floor level.
- .6 Junction boxes that contain branch circuitry shall identify each circuit on the label including panel designation and voltage.
- .7 Conduits 25mm and larger that contain branch circuitry shall identify the panel description, voltage and indicate 'branch circuits'.
- .8 Feeder conduits shall identify the load being fed and the voltage.
- .9 Systems conduits and boxes shall identify the system.
- .10 Provide a sample of the labeling to the consultant for approval prior to the installation.

1.15 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.16 MANUFACTURERS AND CSA LABELS

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

1.17 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and Consultant.
- .2 Decal signs, minimum size 175 x 250 mm.

1.18 LOCATION OF OUTLETS

- .1 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .3 Locate light switches on latch side of doors.

1.19 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.

1.20 LOAD BALANCE

- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.21 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

1.22 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 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 Conduct and pay for the following tests:

Section	System	Test Criteria	Report
26 05 21	Wires and Cables 0-100V	As per miscellaneous feeder test schedule	As per miscellaneous feeder test schedule
26 28 21	Moulded Case Circuit Breakers	As per 26 28 21 Item 3.1.2	Submit manufacturers' start-up report
26 29 10	Motor Starters to 600V	As per motor starter test schedule	As per motor starter test schedule
27 05 14	Communications Cabling Inside Buildings	As per 27 05 14 Item 3.3	As per 27 05 14 Item 3.3

27 11 19	Terminals and Connectors for Building Communications Conductors	As required by 27 05 14	As required by 27 05 14
28 31 02	Multiplex Fire Alarm	As per 28 31 02 Item 3.2	Submit manufacturers' start-up and test reports

- .3 Carry out tests in presence of Consultant.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Submit test results for Consultant's review.

1.23 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Conduct and pay for a complete short circuit coordination study of the protective devices on the normal and emergency distributions. Study shall include a signed and sealed statement from a Professional Engineer with permission to consult in the Province of Saskatchewan. Statement will confirm all components are fully coordinated.
- .2 Provide printouts of all determined breaker settings as well as a detailed single line diagram showing all short circuit fault levels.
- .3 Submit report to Engineer for review prior to manufacturing.

1.25 OWNERS EQUIPMENT

- .1 Prior to ordering any equipment, the Contractor shall confirm the details and specifications of all departmental representative supplied equipment requiring electrical connections. The departmental representative shall supply technical information including electrical ratings and installation details. The coordination of electrical provisions for this equipment is the responsibility of the Contractor and no electrical equipment shall be ordered without written confirmation from the departmental representative. No allowance shall be made to the Contractor for failure to complete this coordination work, thereby resulting in an incorrect installation.

1.26 EQUIPMENT SUPPLIED BY OTHER DIVISIONS

- .1 The Electrical Contractor shall be fully responsible for obtaining electrical ratings, specifications and approved shop drawings of all equipment requiring electrical connections that is supplied by other divisions. No electrical equipment shall be ordered prior to obtaining this information. No electrical equipment shall be ordered prior to a formal review and acceptance of this information by the Electrical Engineer. The Electrical Engineer shall issue written acceptance of the information and shall also provide, if required, documented changes to the electrical design resulting from the review of this information. No allowance shall be made to the Electrical Contractor for failure to complete this coordination work, thereby resulting in an incorrect installation.

Part 2 Products

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Section	Description	Approved Manufacturers
260924	Lighting Control Equipment	Wattstopper, Leviton, G.E., Lutron, Douglas, Gentec
		System Sensor
262726	Wiring Devices	Hubbell, Leviton, P&S
262910	Motor Starters	Cutler Hammer, G.E., Schneider, Siemens, Square D
	Variable Frequency Drives	Cutler Hammer, G.E., Siemens, Square D
262821	Moulded Case Circuit Breakers	Cutler Hammer, G.E., Siemens, Square D
265000	Lighting Equipment	
	Ballasts	Osram Sylvania, Motorola, Lutron, G.E. Lightolier

Part 3 Execution

3.1 NOT USED

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END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2No.65-93(R2008), Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for round copper conductors.
 - .2 Clamp for round copper conductors.
 - .3 Clamp for conductors.
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors.
 - .6 Bolts for aluminum conductors.
 - .7 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required.

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.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.
 - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

- .1 CSA C22.2 No .03-96 (R2000), Test Methods for Electrical Wires and Cables.

1.3 PRODUCT DATA

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600V 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.

2.3 CONTROL CABLES

- .1 Type LVT: 8 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket or an armour of closely wound aluminum wire.
- .2 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 All building wires shall be installed in conduit in accordance with Section 26 05 34.
 - .2 In surface and lighting fixture raceways in accordance with Section 26 05 35.

3.2 INSTALLATION OF ARMoured CABLES

- .1 Group cables wherever possible.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .3 AC90 cables shall be allowed to be used for drops to light fixtures providing the maximum horizontal length does not exceed 1800mm or unless indicated otherwise on the drawings.
- .4 AC90 cables shall be allowed to be used for vertical drops to wiring devices in drywall stud partitions providing the maximum horizontal length from the junction box does not exceed 1800mm. Do not run AC90 cables horizontally in partitions.

3.3 INSTALLATION OF CONTROL CABLES

- .1 Install control cables.
- .2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837-1989 (R1996), Qualifying Permanent Connections Used in Substation Grounding.
- .2 CSAZ32.1-M1986, Safety in Anaesthetizing Locations.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste material in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 EQUIPMENT

- .1 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .2 Insulated grounding conductors: green, type RW-90.
- .3 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 Bonding jumpers, straps.
 - .5 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 end to grounding bushing, solderless lug, clamp or cup washer and screw.
- .7 Make grounding connections in radial configuration only, with connections terminating at street side of water pipe. Avoid loop connections.
- .8 Existing building grounding to be verified and tested for the existing grounding resistance.

3.2 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of primary system.

3.3 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.

3.4 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
 - .2 Sound, fire alarm, intercommunication systems as indicated.

3.5 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Perform tests before energizing electrical system.
- .3 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 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.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 3 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 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.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

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

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.2 CABINETS

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood backboard for surface or flush mounting.

Part 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes unless noted otherwise on drawings.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.1-2012, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

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 for special devices.
- .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 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 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.

2.3 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel poke through with adjustable finishing rings to suit floor finish with brass brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex single receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.

Multi service type 100 mm fire rated poke through complete with hinged brass cover, sheet steel construction and space for devices indicated on plans. Minimum dimensions shall be 200 mm diameter x 485 mm long.

2.4 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 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

2.5 SERVICE FITTINGS

- .1 Pedestal type 'low tension' fitting made of 2 piece stainless steel with brushed aluminum housing.

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. Reducing washers are not allowed.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .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. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2008), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-06, Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05(R2010), Flexible Nonmetallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel, threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Flexible metal conduit: to CSA C22.2 No. 56, steel.

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 3 m oc.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

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.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 PULL CORD

- .1 Polypropylene.

Part 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 unfinished areas.
- .3 Use epoxy coated conduit in corrosive areas.
- .4 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.
- .5 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without a prewired outlet box, connection to surface or recessed fluorescent fixtures and work in movable metal partitions.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .7 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .8 Minimum conduit size for lighting and power circuits: 19 mm.
- .9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 19 mm dia.
- .11 Install pull cord in empty conduits.

- .12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

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 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

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No. 62-93/R1999, Surface Raceway Systems.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate types of raceways with terminology similar to that used in this Section.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 SURFACE NON-METALLIC RACEWAY SYSTEM

- .1 The raceway and all system components must exhibit non-flammable self-extinguishing characteristics to CAN/CSA C22.2 No.62. The raceway base, cover and divider shall be available in 2440mm lengths. The system shall be manufactured of rigid PVC compound and have a textured white finish.
- .2 The raceway shall be a two-piece design with a base and snap-on cover. Total width shall be 170mm x 44mm deep with an approximate thickness of 2.54mm. The raceway shall be available with multiple wiring channels formed by integral barriers in the base.
- .3 The base shall have three wiring channels separated by two integral barriers. Channels must accommodate standard power and communication devices without restricting capacity of adjacent channels. Barriers shall be removable to form one or two channels and divider walls must be available to replace removed barriers.
- .4 A full compliment of fittings must be available including but not limited to, flat, internal and external elbows, tees, entrance fittings, cover clips and end caps. They shall overlap the cover and base to hide uneven cuts and color matched to raceway base and cover. All fittings shall include a base where applicable to eliminate mitering.
- .5 Device brackets shall be available for mounting standard devices in-line or offset from the raceway. A device bracket shall provide up to four single-gang openings at one location.

Part 3 Execution

3.1 INSTALLATION

- .1 Install raceways before installation of wiring. Install covers for raceways and fittings after installation or wiring.
- .2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.
- .3 Keep number of elbows, offsets, connections to minimum.
- .4 Use wiring with mechanical protection in channel raceways.
- .5 Install barriers in raceways where different voltage systems are indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2No.126-M91(R1997), Cable Tray Systems.
- .2 National Electrical Manufacturers Association (NEMA) standards
 - .1 NEMA VE 1-1998, Metal Cable Tray Systems.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with section 01 33 00 - Submittal Procedures.
- .2 Identify types of cable tray used.
- .3 Show actual cable tray installation details and suspension system.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 WIRE MESH CABLE TRAY

- .1 Cable tray and fitting to NEMA VE-1.
- .2 Class C1 to CAN/CSA C22.2 No. 126.
- .3 Wire shall be hot dipped galvanized, cold drawn stainless steel sized and welded to meet load designation.
- .4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cable tray supplied.
- .5 Minimum radius on elbows shall be 600mm.

- .6 Provide barriers as indicated on drawings.
- .7 Bonding jumpers at every section or fitting joint.
- .8 Dimensional details and suspension detail as indicated on the drawings.

Part 3 Execution

3.1 INSTALLATION OF CABLE TRAY

- .1 Install complete cable tray system.
- .2 Support cable tray on both sides as detailed on the drawings.
- .3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.
- .4 Provide fire stop assembly in accordance with Section 26 05 01.

3.2 CABLES IN CABLE TRAY

- .1 Install cables individually.
- .2 Lay cables into cable tray. Use rollers when necessary to pull cables.
- .3 Secure cables in cable tray at 6 m centres, with nylon ties.
- .4 Identify cable tray every 10m with size 2 nameplates in accordance with Section 26 05 01.
- .5 Install ground wire continuous over length of tray or install ground jumpers if tray rating permits.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

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

Part 2 Products

2.1 SWITCHES

- .1 15, 20 A, 120 V or 347 V single pole, double pole, three-way, four-way switches.
- .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 Black toggle style, Leviton #1200 or #1800 Series.
- .3 Rocker operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 Commercial grade duplex receptacles, CSA type 5-15R, 125V, 15A, U ground, with the following features:
 - .1 Black thermoplastic nylon molded body and face.
 - .2 Suitable for No.10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight (8) back wired entrances, four (4) side wiring screws.
 - .5 Triple wipe contacts and riveted grounding contacts.
 - .6 Black standard receptacle, Leviton #5262.

2.3 SPECIAL WIRING DEVICES

- .1 Commercial grade ground fault circuit interrupter receptacles, CSA type 5-15R, 125V, 15A with the following features:
 - .1 Terminals accommodate No. 14-12 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Test and reset button shall match face cover.
 - .4 Eight (8) back wired entrances, four (4) side wiring screws.
 - .5 Heavy duty double wipe contacts.
 - .6 Green LED indicator light.

- .7 Black thermoplastic nylon molded body and face, standard style.
- .8 AC horsepower rating at rated voltage: 1 ½ HP.
- .9 Temp. rise: Max 30°C after 50 cycles OL at 150% rated current.
- .10 Current limiting: 10kA.
- .11 Meet CSA C22.2 No. 42: File LR-57811.
- .12 GFCI receptacle shall be Leviton #7599 Series.
- .2 Pac Poles with the following features:
 - .1 Satin anodized aluminum pole.
 - .2 Cross section of 54mmx60mm.
 - .3 Two (2) separate compartments.
 - .4 Provide receptacles and communication outlets as indicated on drawings.
 - .5 Power cord shall be 3m long.
 - .6 Pole top mounted utility box.
 - .7 Ceiling escutcheon.

2.4 COVER PLATES

- .1 Cover plates for wiring devices.
- .2 Cover plates from one manufacturer throughout project.
- .3 Stamped steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, 1 mm thick cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

2.5 DAYLIGHT SENSOR

- .1 Surface ceiling mounted. Sensor to measure light within space and then wirelessly transmit the light level to the associated dimming device to automatically control lighting level within the space. Sensor to be complete with the following features;
 - .1 Wireless with radio frequency communication to compatible dimming device.
 - .2 Complete with lithium 10 year battery.
 - .3 Shall be capable of 0 – 10,000 fc light source range.
 - .4 Front accessible test buttons.
 - .5 Manual override for 2 hours.
 - .6 41 mm diameter, 17 mm deep.
 - .7 Be compatible with wireless dimming switches within room.

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 toggle switches at height specified in Section 26 05 01 - Common Work Results – Electrical or 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 specified in Section 26 05 01 - Common Work Results – Electrical or as indicated.
- .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

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include time-current characteristic curves for breakers with ampacity of 200A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C 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. Trip settings on breakers with adjustable trips to range from 3-10 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Circuit breakers to have minimum of 10,000 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 as indicated.
- .2 Implement breaker trip unit settings as per coordination study or manufacturers' recommendations. Demonstrate unit operation in the presence of the Consultant.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-2004, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-2002, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Surge Voltages in Low-Voltage AC Power Circuits.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM F1137-00(2006), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 United States of America, Federal Communications Commission (FCC)
 - .1 FCC (CFR47) EM and RF Interference Suppression.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 45 00 - Quality Control.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.
- .3 Photometric data to include: VCP Table spacing criterion.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Disposal of fluorescent lamps.
- .5 Disposal of old PCB filled ballasts (if still existing) on renovation jobs.

Part 2 Products

2.1 LAMPS

- .1 Provide lamps as indicated in luminaire schedule.
- .2 Fluorescent lamps shall be T8 diameter bulb, medium bipin, rapid start type, rated at 20,000 hour life, 3000 initial lumens (32W) 4100°K correlated colour temperature, 85 colour rendering index (CRI).
- .3 Fluorescent lamps shall be T-5HO, T-5 diameter bulb, mini bi-pin, rapid start, rated at 20,000 hour life, 2600 initial lumens (28W), 4100°K correlated colour temperature, 85 colour rendering index (CRI).

2.2 BALLASTS

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
 - .1 Rating: voltage as indicated, for use with 2-32W, rapid start lamps.
 - .2 RFI/EMI suppression circuit to: FCC (CFR47) Part 18, sub-part C, Class A and Part 15, sub-part B, Class B.
 - .3 Totally encased and designed for 40°C ambient temperature.
 - .4 Power factor: minimum 95% with 95% of rated lamp lumens.
 - .5 Crest factor: 1.5 maximum current, 2.0 maximum voltage.
 - .6 Capacitor: thermally protected.
 - .7 Thermal protection: non-resettable on coil.
 - .8 Harmonics: 10% maximum THD, including 49th for electronic discrete and hybrid ballasts, 25% maximum THD including 49th for electromagnetic ballasts.
 - .9 Operating frequency of electronic ballast: 21 khz minimum.
 - .10 Total Circuit Power: 62 Watts.
 - .11 Ballast Factor: greater than 0.90.
 - .12 Sound rated: Class A.
 - .13 Mounting: remote integral with luminaire.
 - .14 Fluorescent dimming ballasts: shall meet the criteria as per 2.2.1.
 - .15 Electronic dimming ballast operation shall not diminish average rated lamp life.
 - .16 Electronic dimming ballast shall not interfere, at any light output level, with infrared devices operating at frequencies between 38 Hz and 42 kHz.
 - .17 Electronic dimming ballast shall provide end-of-lamp-life protection for T5-HO linear and T4 4-pin lamps.
 - .18 Electronic dimming ballast shall be capable of striking lamps at any light level without first flashing to full light.
 - .19 Electronic dimming ballast shall have a continuous flicker free dimming range of 100% to 5% measured relative light output (RLP) for T5-HO, T8 and T12 linear fluorescent lamps, and T4 4-pin triple-tube compact fluorescent lamps.
 - .20 Electronic dimming ballast shall not be damaged by miswires between any input power and control connections and any lamp leads to each other and/or ground.

Part 3 Execution

3.1 INSTALLATION

- .1 Install new light fixtures in locations as indicated.
- .2 Salvage, re-locate and install luminaires as indicated.
- .3 Provide plaster frame and trim as required, and turn over to trade providing ceiling installation.
- .4 Support luminaries directly from building structure.
- .5 Install recessed fluorescent luminaries so that they can be completely removable from below the finished ceiling.
- .6 Replace new ballasts, which in the opinion of the electrical consultant, are found to exhibit excessive noise.
- .7 Coordinate installation of luminaries with mechanical contractor to avoid conflicts between luminaries, and mechanical system components.

3.2 WIRING

- .1 Connect luminaires to lighting circuits.

3.3 LUMINAIRE SUPPORTS

- .1 For luminaires mounted in suspended ceilings, support luminaires from ceiling grid in accordance with local inspection requirements
- .2 Support fluorescent luminaires mounted in continuous rows once every three m..

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.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Atomic Energy Control Board Regulations
- .2 Canadian Code for Preferred Packaging
- .3 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.141-02, Unit Equipment for Emergency Lighting.
 - .2 CSA C860- 07, Performance of Internally-Lighted Exit Signs.
- .4 National Fire Protection Association (NFPA) requirements

1.2 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittals.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 61 33 - Hazardous Materials. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .3 Submit product data sheets for exit lights. Include product characteristics, performance criteria, physical size, limitations and finish.
- .4 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, and cleaning procedures.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 STANDARD UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

- .2 Housing: cast anodized extruded aluminum housing, as per schedule.
- .3 Face and back plates: extruded aluminum.
- .4 Lamps: LED.
- .5 Letters: 150 mm high x 19 mm, with 13 mm thick stroke, red on die-cast aluminum face, reading EXIT and SORTIE.
- .6 Downlight: translucent acrylic in bottom of unit.
- .7 Face plate to remain captive for relamping.
- .8 Exit light shall be suitable for wall, end or ceiling mounting as determined on site.
- .9 Blank faceplate for the back of single face exit signs, shall not have any knockouts.
- .10 The exit light shall be illuminated with a minimum of 21 LED's along the top, and 19 LED's along the bottom of the exit light interior. The LED's shall be contained in an acrylic lens panel, which shall evenly distribute light on the lettering. The module containing the LED's shall be capable of illuminating both single and double face exit signs.
- .11 LED's shall be connected in parallel (not series) so that failure of an LED shall not cause more than 5 LED's to be extinguished.
- .12 Exit light input shall be maximum 2 watts.
- .13 LED's shall operate on 347 volt, without the use of any external transformer.
- .14 Design life for the exit light shall be minimum 25 years.

Part 3 Execution

3.1 INSTALLATION

- .1 Install exit lights in plain view as indicated, and in accordance with the latest edition of the National Building Code.
- .2 Exit lighting shall be connected to a separate AC circuit dedicated to exit lighting only, and shall also be connected to an emergency power supply source.
- .3 Coordinate installation of exit lights with ceiling or wall construction. If necessary, provide hanger to suspend exit light below visual obstructions.

END OF SECTION