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WOODVALE PENTECOSTAL CHURCH
PHASE 2

ELECTRICAL SPECIFICATION
Issued for 70% Review

Prepared by:

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GWAL 2021-284
November 12, 2021

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PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Refer to General Instructions, Contract Requirements, Amendments and Divisions 00 & 01 and be governed by same.

1.2 REFERENCES

.1 Definitions:
- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE 100 CD.

.2 Reference Standards use current enforced edition of the following:
- .1 CSA Standards.
  - .1 CSA C22.1-21, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations, (25th Edition).
  - .2 CSA C22.3 No. 1-20, Overhead Systems.
  - .3 CSA C235-2019, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical Equipment Manufacturers Association of Canada (EEMAC)
  - .1 EEMAC Y1-1-1955, Equipment Green Colour for Outdoor Electrical Equipment.
  - .2 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Electrical Safety Authority (ESA)
  - .1 Ontario Electrical Safety Code (OESC), 27th edition - 2018.
- .4 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  - .1 IEEE 100 CD (2013), Standards Dictionary: Glossary of Terms and Definitions.
- .5 Inspection authorities shall mean Electrical Safety Authority.
- .6 National Fire Protection Association (NFPA).
- .7 Ontario Elevator Code.
- .8 Ontario Fire Code.
- .9 Ontario Regulation
  - .1 ONTARIO OBC-2012, 2012 Ontario Building Code.
- .10 Supply authority shall mean Hydro Ottawa.
- .11 Underwriters Laboratories of Canada (ULC)
  - .1 CAN-ULC-S524-2019, Standard for the Installation of Fire Alarm Systems.
  - .2 CAN-ULC-S561-13-R2018, Standard for Installation and Services for Fire Signal Receiving Centres and Systems.

1.3 ACTION AND INFORMATION SUBMITTALS

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

.2 Shop drawings:
- .1 Submit single electronic format (pdf) of shop drawings and product data along with transmittal. Hard copy shop drawings shall not be accepted.

.2 The review is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents.

.3 Do not commence manufacture or order materials before shop drawings are reviewed.

.4 Shop drawings shall clearly indicate:

- .1 Name of Contractor.
- .2 Name of component.
- .3 Name of service or system.
- .4 Contractors signed review stamp.

.5 Shop drawings shall include, but is not limited to, the following information:

- .1 Arrangement of specific system.
- .2 Electrical characteristics, volts, phase, amps, etc.
- .3 Dimensions of equipment and required clearances.
- .4 Performance data.
- .5 Finish.
- .6 Gauge of materials.
- .7 Wiring diagrams (where applicable).
- .8 Product data (where applicable).

.6 Review relevant shop drawings of other Divisions to ensure interface of systems with respect to wiring, voltages, ampacities, phases, size, controls, etc. Notify Engineer of any discrepancies immediately.

.7 Provide shop drawings for equipment as indicated in this specification.

.8 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.

.9 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.10 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.11 Submit required number of copies of drawings and product data to inspection authorities.

.12 If changes are required, notify Engineer of these changes before they are made.

.3 Certificates:

- .1 Provide CSA certified equipment and material.
- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Permits and fees: in accordance with General Conditions of contract.
- .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Engineer.

.4 Manufacturer's Field Reports: submit to Engineer manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
- .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.
- .3 Post engraved operating instructions where directed.
- .4 Submit hard copy and pdf for review and submit final version in hard copy and pdf.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials and equipment in accordance with manufacturer's recommendations in clean, dry, well-ventilated, heated area.
- .2 Store and protect equipment from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

1.6 GENERAL

.1 Provide shall mean supply, install, connect, test and commission.

.2 Commence work upon notification of acceptance of offer, or as outlined in the approved construction schedule.

.3 Verify equipment delivery times immediately and notify engineer within two (2) weeks of contract award of any deliveries which would affect schedule.

.4 Comply with National Building Code (Part 8, Safety Measures at Construction and Demolition Sites) and Provincial Regulations for Construction Projects.

1.7 EXISTING SERVICES

.1 Existing services required for work may be used by the Contractor with the Owners written consent. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.

.2 Notify the Owner a minimum of 72 hours in advance of intended interruption of services; obtain requisite permissions.

.3 Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends or as approved by the Owner in writing.

.4 Any unscheduled disruption to services to be immediately reinstated.

.5 Existing and security systems are to remain fully functional, throughout, provide conduit and wire as required to maintain services during construction.

1.8 EXAMINATION

.1 Examine site and conditions which will affect the work. Submission of tender shall be deemed as confirmation that tenderer has inspected site and is conversant with conditions, and shall not constitute additional costs as a result of site conditions.

.2 Verify existing conditions including but not limited to, structural elements, sprinkler piping and heads, roof drains and storm sewer piping, electrical conduit and wiring, process utility piping, ductwork and other building services.

.3 The fact that not all existing conditions discussed in Item .2 above are shown on the drawings does not relieve the responsibility of coordinating the work with the existing construction.

1.9 CO-ORDINATION

.1 Co-ordinate the work with all other Divisions, to ensure systems compatibility, and to ensure schedules and requirements are maintained.

.2 Where perceived interferences occur, prepare detailed sketches indicating proposed solution for review and acceptance by Engineer.

1.10 AS-BUILT DRAWINGS

.1 Site records:
- .1 Electrical sub-contractor shall mark all changes as work progresses and as changes occur.
- .2 On a weekly basis, transfer information to record set of documents, revising to show all work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection at all times.

.2 As-built drawings:
- .1 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

1.11 GUARANTEES AND WARRANTIES

.1 Before completion of work, collect all manufacturer's signed guarantees and warranties and submit to the Engineer.

.2 Identify, bind and index material in maintenance manuals.

.3 Submit a written, signed guarantee stating that all systems and components have been installed to manufacturers recommendations and that systems are operating satisfactorily and meet the design requirements, and all material and labour deficiencies will be corrected, at no cost, for a period of one year after substantial completion. In addition, submit extended warranties and guarantees as identified in this specification.

1.12 CONTRACT DOCUMENTS

.1 Drawings and specifications are complementary, items shown or mentioned in one and not in the other are deemed to be included in the contract work.

.2 The contract documents are intended to describe complete fully functional systems although not all components are indicated. Provide all required conduits, wiring, equipment, etc. to provide fully functional systems which meet the design intent.

.3 Discrepancies in the design documents, or doubt as to the full intent of the design shall be brought to the Engineer's attention prior to tender close. Failure to do this means that the Contractor is fully aware and shall be responsible of design intent and requirements and shall provide fully functional and coordinated systems.

1.13 PROJECT SCHEDULE

.1 Submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion.

.2 Include in schedule all plant shutdowns causing interruption of services to the building occupants will be scheduled for unoccupied hours (nights or weekends) as approved by the Owner and Engineer. Provide minimum of 72 hours notice.

.3 When schedule has been reviewed and approved, take necessary measures to complete work within scheduled time. Any change of schedule must be authorized.

1.14 COST BREAKDOWN

.1 Within one (1) week of award of contract, submit breakdown of costs as separate amounts of labour, materials, etc. of each system. Break down electrical systems generally as follows:
- .1 Mobilization and start-up.
- .2 Permits and inspections.
- .3 Site work.
- .4 Distribution.
- .5 Coordination study.
- .6 Branch circuit roughing.
- .7 Wiring devices.
- .8 Lighting:
  - .1 Interior.
  - .2 Exit Lights.
- .9 Generator & associated equipment.
- .10 Testing, commissioning and job cleanup.

.2 After review and approval, cost breakdown will be used as the basis of progress payments.

1.15 PERMITS, FEES AND INSPECTIONS

.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 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish Certificates of Acceptance from Electrical Inspection Department and authorities having jurisdiction on completion of work to Engineer and include in manuals. Final payment will not be made until certificates have been submitted.

1.16 TRADE QUALIFICATIONS

.1 The work shall be carried out by licensed electricians with who holds valid Ontario Certificates of Qualifications, and current contractors license.

.2 Contractor to carry valid current Contractor's License.

.3 The ratio of Journeymen to Apprentices shall not exceed the ratio in the Trade Qualifications and Apprenticeship Act of Ontario.

.4 Submit list of employees and qualifications for all personnel on site upon request.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CSA C235.

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

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

2.2 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified.

.2 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction.

.2 Decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws for termination of wiring are suitable for both copper and aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:
- .1 Nameplates:
  - .1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

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:
  - .1 Electronically printed, self-adhesive plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates to be as indicated c/w volts, phase, amps, HP, etc.
- .4 Allow for average of twenty-five (25) letters per nameplate.
- .5 Identification to be English.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage, Size 7.
- .8 Terminal cabinets and pull boxes: indicate system and voltage, Size 7.
- .9 Transformers: indicate capacity, primary and secondary voltages, Size 7.
- .10 Panelboards nameplate, Size 7.
- .11 Provide typed circuit directory for each panelboard.
- .12 Identify all receptacle outlets by panel, circuit number and voltage, with Brother P-Touch labeller.
- .13 Provide identification on service poles and prewired partitions at 300 mm A.F.F.
- .14 Provide system, circuit, voltage, phase, etc., on all ceiling space junction box covers, red for fire alarm & emergency circuits, black for others.
- .15 All circuit protective devices to be c/w a lamicoid label mounted inside door of device listing all fuse type and ratings, circuit breaker settings and minimum interrupting ratings.
- .16 All switchboards and panelboards to have a permanent lamicoid label mounted on inside of door with minimum circuit breaker interrupting rating.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered on both ends of phase conductors of feeders and branch circuit wiring respectively.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1 and OESC.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	blue	
up to 600 V	yellow	
Voice/data	green	
Security	green	blue
Emergency power (250V)	red	blue

2.9 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.
- .2 Paint indoor distribution enclosures light grey to EEMAC 2Y1.

.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 or cut ends of galvanized hangers, racks and fastenings to prevent rusting.

2.10 SPRINKLER-PROOF EQUIPMENT

.1 All equipment to have sprinkler proof drip shields and ventilation openings.

2.11 ACCESS DOORS

.1 Provide access doors as required by inspection authorities and Engineer to ensure access to concealed electrical work.

.2 Access doors shall have fire resistance rating equal to wall or ceiling in which door to be installed. Minimize access door requirements and obtain approval of locations prior to electrical systems installation. Prepare a sketch drawing indicating locations for review by Owner/Architect/Engineer and submit in accordance with shop drawing submittal.

.3 Submit access door shop drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 and OESC except where specified otherwise.

.2 Do underground systems in accordance with CAN/CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

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

3.3 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. Provide additional support as required.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors, unless otherwise indicated.

.5 Co-ordinate exact locations, dimensions and mounting heights with architectural and interior design layouts, and/or millwork details and elevations.

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 indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.
- .1 Local switches: 1100 mm.
- .2 Wall receptacles:
  - .1 General: 400 mm.
  - .2 Above top of continuous baseboard heater: minimum 200 mm.
  - .3 Above top of counters or counter splash backs: 175 mm.
  - .4 In mechanical rooms: 1200 mm.
- .3 Panelboards: as required by Code or as indicated.
- .4 Telephone and interphone outlets: 400 mm.
- .5 Wall mounted telephone and interphone outlets: 1100 mm.
- .6 'F' indicates floor mounted, 'C' indicates ceiling mounted.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overload settings, overcurrent trips, relays and fuses are installed to required values and settings in accordance with equipment data.

3.6 FIELD QUALITY CONTROL

.1 Conduct following tests in accordance with manufacturer's recommendations.
- .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
- .2 Lighting and its control.
- .3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .4 Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Check resistance to ground before energizing.
- .5 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 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Carry out tests in presence of Engineer. Provide minimum 7 days notice.

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

.4 Manufacturer's Field Services:
- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL 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 SYSTEM START UP

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

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.8 CLEANING

.1 Progress Cleaning:
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management: separate waste materials for reuse and recycling.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.4 Clean areas under contract to a condition at least equal to that previously existing and to approval of Engineer.

.5 Provide cleaning of light fixture reflectors, lamps and lenses, vacuum and clean panelboards, cabinets switchgear, etc., upon completion of contract, to Engineer's satisfaction.

3.9 ANCHORING METHODS

.1 Electrical equipment, fixtures, cable tray, conduit and cabling is to be securely anchored or fastened to the building structure using drilled hole wedge anchors for concrete structures or steel clamps for steel structures.

.2 Air, fuel or powder actuated devices or any other equivalent type of fastening devices are not to be used.

.3 Where anchoring method forms part of seismic restraint requirements, anchoring methods to comply with Section 26 05 04 - Seismic Restraint Systems (SRS).

3.10 CUTTING, PATCHING & MAKING GOOD

.1 Provide cutting & patching of existing surfaces as required to accommodate new work.

.2 Patch and make good surfaces cut, damaged or disturbed, to Engineer's approval. Match existing material, colour, finish and texture or as indicated otherwise.

.3 Provide dust tight screens or partitions to localize dust generating activities and for protection of finished areas of work, workers and public.

.4 Scan slabs before coring or drilling deeper than 1" (25 mm). Provide all required notification, clearance & protection for scanning process. Adjust coring & drilling locations as necessary to avoid rebar & conduits.

3.11 FINAL INSPECTION

.1 Do not request final inspection until:
  .1 All previously noted Deficiencies have been addressed.
  .2 All systems have been tested and are ready for operation.
  .3 Preliminary load balancing has been completed.
  .4 The Owner's operating personnel have been instructed in the operation of all systems and equipment.
  .5 The complete operation and maintenance data books have been delivered to the Engineer.
  .6 All inspection certificates have been furnished.
  .7 All record drawings have been completed and approved.

.8 All spare parts and replacement parts have been provided and receipt of same acknowledged.
.9 The cleaning up is finished in all respects.

.2 Final inspection shall be subject to the approval of the Engineer.

3.12 FIRE AND SMOKE STOPPING

.1 Provide fire and smoke stopping where conduits, cables, trays, etc., penetrate floor slabs or fire rated walls with an approved ULC listed putty, equal to 3M caulk CP25 and putty 303.

.2 Installation of fire stops by trained manufacturers representative.

3.13 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Building Owner to facilitate work as stated.

.2 Particular attention shall be given to minimizing dust, noise and other forms of contamination from occupied areas.

.3 Maintain existing services to building and provide for personnel and vehicle access.

.4 Existing services required for work may be used by the Contractor with the Owners written consent. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.

.5 Notify the Owner a minimum of 72 hours in advance of intended interruption of services; obtain requisite permissions.

.6 Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends or as approved by the Owner in writing.

.7 Any unscheduled disruption to services to be immediately reinstated at contractors own expense.

.8 Existing fire alarm and security systems are to remain fully functional, throughout, provide conduit and wire as required to maintain services during construction.

.9 Where fire alarm protection and security is reduced by work, provide temporary means to maintain fire alarm protection and security.

3.14 PROTECTION

.1 Protect access areas through existing building (lobby, elevator, corridor stairwell, etc.) from damage. Clean area daily or more frequently if directed by Engineer.

.2 Protect exterior areas (roof, walls, etc.) against damage during handling of new and removed materials.

.3 Repair and make good all damaged equipment, etc. to satisfaction of the Engineer.

.4 Protect stored materials, work in process and finished work against damage until take-over.

.5 Protect adjacent areas against spread of dust and dirt beyond work areas.

.6 Protect operatives and other users of site from all hazards.

3.15 DEMOLITION

.1 Unless otherwise specified, 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 Existing lighting ballasts may contain P.C.B.'s. Contact the local Ministry of Environment (M.O.E.) office for confirmation of ballasts containing P.C.B. material. Submit written confirmation from M.O.E. verifying the presence or non-presence of P.C.B.'s. If P.C.B.'s are found to be present, provide removal of ballasts from light fixtures and place in approved 45 gallon drums for storage on site. Handle P.C.B. contaminated equipment in accordance with codes, standards and guidelines.

.3 Disconnect and make safe all systems to be demolished.

.4 Maintain and protect existing remaining circuits, systems, etc., which pass through construction/demolition areas.

.5 Remove all redundant wiring and conduit in ceiling spaces, (power, communications, systems, etc.).

Project: Date:

Item		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
Job Set-up (Mobilization)							
Permits & Inspections							
Site Work							
Distribution	Material						
	Labour						
Branch Circ. Roughing	Material						
	Labour						
Wiring Devices	Material						
	Labour						
Lighting (Interior & Exterior)	Material						
	Labour						
Emergency & Exit Lighting	Material						
	Labour						
Fire Alarm	Material						
	Labour						
Data/Communications Raceways	Material						
	Labour						
Generator & Transfer Switches (if applicable)	Material						
	Labour						
	Start-up						
Systems – Security, Data Communication Cabling, PA System, Nurse Call, Intercom (job specific)	Material						
	Labour						
	Start-up						

Project: Date:

Item		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
Motor Control (if applicable)	Material						
	Labour						
Testing & Job Clean-up (Demobilization)							
Commissioning							
As-builts and O&M Manuals							
TOTAL ORIGINAL CONTRACT AMOUNT							
Change Orders							
Architect's CO #	GWA CCO or SI #						
#	#						
#	#						
Total Change Order Amount							
TOTAL CONTRACT AMOUNT							

NOTE: Change Orders that do not reference the Architect's Change Order number and Goodkey, Weedmark's Contemplated Change Order (CCO) or Site Instruction (SI) number will not be reviewed.

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

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 by Division 26. This includes, but is not limited to, electrical light fixtures, transformers, MCC's, UPS, diesel generators, fire protection, conduit, communications, electrical equipment and systems, both vibration isolated and statically supported.

.2 Cable restraint systems, rod stiffener clamps and seismic isolator capacities to be verified by an independent test laboratory. Connection materials and site specific designs to be by the Seismic Engineer. The Seismic Engineer may specify material and anchors provided by the contractor where this is appropriate. It is the contractors' responsibility to ensure that the Seismic Engineers' requirements and specification have been met.

1.4 REFERENCES

.1 Canadian Standards Association (CSA)
  .1 CSA S832-14 (R2019), Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

.2 Ontario Regulation
  .1 ONTARIO OBC-2012, 2012 Ontario Building Code.

1.5 SUBMITTALS

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

.2 Submit seismic restraint shop drawings, c/w seal of Professional Engineer registered in Province of Ontario, clearly identifying equipment/systems reviewed and the equipment/systems requiring restraint. Shop drawings must clearly show all forces transferred to structure.

.3 Seismic Design Engineer shall provide a spreadsheet identifying all equipment and systems requiring or not requiring seismic restraints and include all circulations.

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

1.6 MAINTENANCE DATA

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

1.7 SEISMIC FORCE

.1 The Importance Factor for this project is:
.1 I = 1.0 - All other buildings i.e.: Office & General Buildings.
Note: As per OBC.

PART 2 - PRODUCTS

2.1 SRS MANUFACTURER

.1 SRS to be from one manufacturer regularly engaged in production of same, 5 years experience.

.2 Acceptable materials: Korfund-Sampson, Mason Industries, Tecoustics, Vibra-Sonic Control, Vibron.

2.2 GENERAL

.1 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.

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

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

.4 Design and installation in accordance with OBC and CSA S832.

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

.6 SRS to restrain seismic forces in all directions.

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

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

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

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

.11 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 Install Seismic Restraint Systems in accordance with Seismic Engineer's and manufacturer's recommendations.

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

.3 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 Engineer 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 Engineer complete set of construction documents, revised to show "as-built" conditions.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 CSA International
- .1 CSA C22.2 No. 18.4-15 (R2019) - Hardware for the Support of Conduit, Tubing, and Cable.
- .2 CAN/CSA C22.2 No. 65-18, 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: CAN/CSA C22.2 No. 65, with current carrying parts of copper sized to fit conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 & NEMA to consist of:
- .1 Connector body and stud clamp suitable for application to conductors.
- .2 Clamp suitable for application to conductors.
- .3 Stud clamp bolts.
- .4 Bolts for copper conductors, bar.
- .5 Bolts for aluminum conductors, bar.
- .6 Sized for conductors and bars as required.

.4 Clamps or connectors for armoured cable, TECK cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed as required to: CAN/CSA C22.2 No. 18.4.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables and:
- .1 Apply coat of suitable joint compound on aluminum alloy conductors prior to installation of connectors in accordance with manufacturer's recommendations.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA C22.2 No. 65.

.3 Install fixture type connectors and tighten to CAN/CSA C22.2 No. 65. Replace insulating cap.

.4 Install bushing stud connectors in accordance with EEMAC 1Y-2 and NEMA.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

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 insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE for all buried services, Jacketted. 600 V rating up to 347 V & 1000 V rating up to 600 V.

2.2 TECK 90 CABLE

.1 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper.

.2 Insulation:
- .1 Cross-linked polyethylene XLPE.
- .2 Rating: 600 V up to 347 V & 1000 V rating up to 600 V.

.3 Inner jacket: polyvinyl chloride material.

.4 Armour: interlocking galvanized steel.

.5 Overall covering: thermoplastic polyvinyl chloride, FT4 or as indicated, compliant to applicable Building Code classification for this project.

.6 Fastenings:
- .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at minimum 1500 mm centres.
- .3 Threaded rods: 6 mm diameter to support suspended channels.

.7 Connectors:
- .1 Watertight compression type, explosion-proof approved for TECK cable.

2.3 MINERAL- INSULATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.

.3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250 degrees C.

.4 Two hour fire rating.

.5 Connectors: watertight compression type, field installed approved for MI cable.

.6 Termination kits: field installed approved for MI cable

2.4 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.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

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

.2 Perform ground & meg ohm, phasing tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

3.3 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.

3.4 INSTALLATION OF TECK 90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable concealed except in service or utility spaces, securely supported by straps & hangers.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Install cable concealed except in service & utility or as indicated, securely supported by straps & hangers.

.2 Support at minimum 1 m intervals.

.3 Make cable terminations by using factory-made termination kits.

.4 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

.2 Installation of armoured cables shall be permitted from:
  .1 Conduit system junction boxes to recessed lighting fixtures in suspended ceilings, maximum length 2.5 m each run.
  .2 Conduit system junction boxes to hollow gypsum partitions, maximum length 2.5 m each run.
  .3 AC-90 is permitted in hollow gypsum partitions.
  .4 AC90 is not permitted in insulated masonary walls or concrete walls.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Institute of Electrical and Electronics Engineers (IEEE)
  .1 IEEE 837-2014, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit ground continuity and resistance test reports prior to closeout.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with 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 in accordance with Authority having Jurisdiction.

.2 Insulated grounding conductors: green, copper conductors, size in accordance with Authority having Jurisdiction.

.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 Compression wire connectors.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.

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

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main and electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to IEEE 837.

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

.6 Soldered joints not permitted.

.7 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.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

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

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

.11 Ground secondary service pedestals.

.12 Provide ground conductor in all conduits and raceways.

.13 Ground all systems raceways. Provide ground bushings.

.14 Ground all gas piping within building including roof areas with #6 AWG.

.15 Provide #6 AWG copper ground conductor to all telephone/communications/ data terminal cabinets or backboards.

.16 Provide #6 AWG green insulated ground in all cable troughs bonded at 3 m intervals.

.17 Provide new 'ground bars' where indicated, each a length of copper busbar, 450 mm W, 100 mm H, 6 mm D, mounted on insulating offset adaptors (phenolic plastic). Each ground window to be interconnected as indicated and grounded to the building service ground. Provide compression type cable connectors, 2 hole type at each end.

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 of communication equipment room and where indicated.

.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size in accordance with AHJ and minimum #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 Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

.5 Provide test report for static dissipative flooring installation and grounding.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, galvanized, minimum size 41 x 41 mm, 2.5 mm thick or to suit site conditions.

2.2 THREADED RODS

.1 Galvanized, minimum 9 mm diameter.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields or toggle bolts.

.2 Secure equipment to poured concrete with expandable inserts in accordance with Section 26 05 00 - Common Work Results for Electrical and Section 26 05 04 - Seismic Restraint Systems (SRS).

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

.4 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.

.5 Suspended support systems.
- .1 Support individual cable or conduit runs with 9 mm diameter threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 9 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.6 For surface mounting of two or more conduits use channels.

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

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

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

.10 Do not use supports or equipment installed for other trades for conduit or cable support.

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

.12 Complete installation in accordance with Section 26 05 04 - Seismic Restraint Systems (SRS).

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide shop drawings and submittals in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 - PRODUCTS

2.1 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on covers.

PART 3 - EXECUTION

3.1 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

3.2 IDENTIFICATION

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

.2 Identification Labels: size 2 indicating system name, voltage and phase.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-21, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations (25th Edition).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit shop drawings for floor boxes.

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 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

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

2.3 CONDUIT BOXES

.1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.4 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.5 FITTINGS - GENERAL

.1 Plastic bushing or connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet boxes for conduit up to 35mm and pull boxes for larger conduits.

.4 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 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18.3-12 (R2017), Conduit, Tubing, and Cable Fittings.
- .2 CSA C22.2 No. 83-M1985 (R2017), Electrical Metallic Tubing.
- .3 CSA C22.2 No. 211.2-06 (R2016), Rigid PVC (Unplasticized) Conduit.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

PART 2 - PRODUCTS

2.1 CONDUITS

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

.2 Rigid pvc conduit: to CSA C22.2 No. 211.2. FT-4 rated unless installed in-slab.

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 in accordance with Authority Having Jurisdiction.

.4 Threaded rods, minimum 6 mm diameter, to support suspended channels. Galvanized in damp or wet locations.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18.3, 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 set-screw connectors and couplings for EMT.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 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 and in unfinished areas, unless otherwise noted.

.3 Use electrical metallic tubing (EMT) except in cast concrete, unless otherwise noted.

.4 Use rigid pvc conduit underground.

.5 Use flexible metal conduit for connection to motors in dry areas, connection to light fixtures, 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.
.1 Fill with compound.

.8 Minimum conduit size for lighting and power circuits: 21 mm.

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

.10 Mechanically bend steel conduit over 21 mm diameter.

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

.12 Install fish cord in empty conduits.

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

.14 Dry conduits out before installing wire.

.15 Maintain maximum spacing between power and low-voltage communications conduits.

.16 Do not use supports or equipment of other trades to support conduit or cable except with permission of other trades and approval of Engineer.

.17 Ream raceways to remove burrs.

.18 Run parallel or perpendicular to building lines.

.19 Do not install horizontal runs in masonry walls.

.20 Do not install conduits in terrazzo or concrete toppings.

.21 Provide unistrut assembly independently anchored to building structure for support of conduits.

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 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 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.2 No. 126.1-17, Metal Cable Tray Systems.

.2 National Electrical Manufacturers Association (NEMA)
- .1 NEMA VE 1-2017, Metal Cable Tray Systems.
- .2 NEMA VE 2-2018, Cable Tray Installation Guidelines.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: submit manufacturer's product data sheets for cable tray indicating dimensions, materials, and finishes, including classifications and certifications.

.3 Shop Drawings: submit shop drawings showing materials, finish, dimensions, accessories, layout, and installation details.

.4 Identify types of cabletroughs used.

.5 Show actual cabletrough installation details and suspension system.

PART 2 - PRODUCTS

2.1 CABLETROUGH

.1 Metal cabletroughs and fittings: to NEMA VE 1 and CSA C22.2 No. 126.1.

.2 Wire mesh type, Class A to CSA C22.2 No. 126.1.

.3 Trays: extruded aluminum, 100 mm wide with depth of 100 mm.

.4 Ground cable trays with #6 AWG insulated green copper conductor attached to each tray section.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install complete cabletrough system in accordance with NEMA VE 2.

.2 Support cabletrough on both sides.

.3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International) / National Standard of Canada
  .1 CSA C9-17, Dry-Type Transformers.

.2 Underwriters Laboratories
  .1 UL 1449, Surge Protective Devices.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

1.4 ACCEPTABLE MANUFACTURERS

.1 Eaton Cutler/Hammer.

.2 Siemens.

.3 Schneider/Square D.

.4 G.E.

.5 Equipment supplied shall be of a single manufacturer.

1.5 RATINGS

.1 Equipment supplied shall have interrupting capacities in excess of currents calculated in the short circuit study.

1.6 OVERCURRENT PROTECTION

.1 Confirm overcurrent protection requirements of equipment supplied by Divisions 20, 21, 22 & 23, Architectural Divisions and equipment supplied by Owner prior to installation.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Heavy duty non-fusible, disconnect switch in CSA Enclosure I, size as indicated. CSA 3 Enclosure in outdoor or damp locations.

.2 Provision for padlocking in off switch position.

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

.4 Quick make, quick break type.

2.2 STANDARD DRY TYPE TRANSFORMERS

.1 Type: ANN, to CSA C9 - Dry Type Transformers.

.2 Voltage taps: 4-2½% Taps, 2 FCAN, 2FCBN.

.3 Insulation: Class H, 150°C temperature rise.

.4 Basic Impulse Level (BIL): standard.

.5 Hipot: standard.

.6 Internal vibration isolation.

.7 Average sound level: less than 45 dB.

.8 Impedance at 170°C: less than 6.5%.

.9 Enclosure: EEMAC I, removable metal front panel. Sprinklerproof where required by authorities.

.10 Floor mounted for 75 kVA and above, floor or wall mounted up to 45 kVA.

.11 Copper windings.

2.3 PANELBOARDS

.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.

.3 250 and 600 V panelboards: bus and breakers rated for interrupting capacity as indicated in coordination study.

.4 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.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated. Copper bus.

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

.7 Mains: suitable for bolt-on breakers, copper.

.8 Panel must be capable of accepting 3 pole breakers anywhere in panel.

.9 Trim with concealed front bolts and hinges. 14 gauge up to 24 circuit, 12 gauge for larger panels.

.10 Distribution panels shall be minimum 12 gauge construction.

2.4 MOULDED CASE CIRCUIT BREAKERS

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

.3 Circuit breakers with interchangeable trips as indicated.

.4 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 Confirm equipment locations and sizes in electrical and mechanical rooms to ensure equipment will fit.

.2 Secure floor and wall mounted equipment plumb and square.

.3 Connect supply and load feeders from all equipment.

.4 Check trip unit and fuse ratings to match those recommended in coordination study.

.5 Check factory made connections for secureness and electrical continuity.

.6 Provide isolation pads for floor mounted transformers.

.7 Install fuses as required.

.8 Ensure adequate clearances around equipment for ventilation requirements and code.

.9 Ground secondary neutral of dry type transformers to primary source ground system.

.10 Install panelboards plumb and true and make connections.

.11 Provide auxiliary equipment and connections as required.

.12 Install surge suppression equipment integral to electrical equipment. Where SPD must be installed external to assembly, lead length between the breaker and suppressor shall be kept as short as possible. Any excess conductor length shall be trimmed in order to minimize let-through voltage.

.13 Test surge suppression equipment in accordance with UL 1449 & provide test results.

.14 Provide typed, dated panel directory for each affected panelboard on this project.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International) / National Standard of Canada
  .1 CAN/CSA C233.1-87 (R2004), Gapless Metal Oxide Surge Arresters for Alternating Current Systems.

.2 National Electrical Manufacturers Association (NEMA)
  .1 NEMA LS 1, Low Voltage Surge Protective Devices.

.3 National Fire Protection Association (NFPA)
  .1 NFPA (Fire) 70, National Electrical Code (NEC), 2020 Edition.

.4 Occupational Safety and Health Standards (OSHA)
  .1 OSHA 29 CRF, Safety and Health Regulations for Construction.
    .1 1910.7, Definition and Requirements for a Nationally Recognized Testing Laboratory.

.4 Underwriters Laboratories
  .1 UL 1449, Surge Protection Devices.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

1.4 WARRANTY

.1 The following warranty requirements shall be in addition to, and run concurrent with other warranty requirements provided in project Contract Documents. Minimum Requirements:
  .1 Twenty-Five (25) Years Unlimited Replacement Warranty on all parallel-wired surge protective devices (SPD). Additionally, the warranty shall state that during the applicable warranty period any SPD which fails due to any transient surge activity, including lightning, shall be repaired or replaced by the manufacturer without charge.
  .2 Special or optional warranties in excess of the unit's standard warranty for purposes of this bid are not acceptable.
  .3 Warranty shall be for purchaser, building owner or end user and shall not be dependent on specific purchase entity for unit.
  .4 In the event the SPD is destroyed, there shall be full replacement of damaged or failed suppressor. Pro-rating is not allowed.
  .5 No exclusions from transient surge events (i.e. lightning strike, arcing fault on system, facility or utility transients). Gross negligence is excluded (i.e. removing system neutral to ground bond, Hi-Pot testing with SPDs on-line, etc.).

.2 Since "Acts of Nature" or similar statements typically include the threat of lightning to which the SPDs shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this particular section. That is, the warranty must specifically provide for unlimited free replacements of the SPD in the event of failure caused by the effects of lightning and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only.

.3 Provide electrically operated equipment specified in this Section that is listed and labelled. As defined in the National Electrical Code, Article 100, Listing and Libelling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

.4 Comply with NFPA (Fire) 70 and former NEMA LS1.

1.5 MANUFACTURER QUALIFICATIONS

.1 The SPD's shall be manufactured in Canada or USA by a manufacturer that has been regularly engaged in the design, manufacturing and testing of SPD's of the types and ratings required for a period of not less than five years. Manufacturers requesting product approval must meet or exceed the written specification contained herein. Manufacturers requesting approval must receive written verification of product acceptance by the specifying engineer 10 days prior to the bid date.

PART 2 - PRODUCTS

2.1 SURGE PROTECTIVE DEVICES (SPDS)

.1 Designed, manufactured and tested in accordance with UL 1449.

.2 Integrated into electrical distribution equipment wherever possible.

.3 Unit Operating Voltage (UOV): As indicated on drawings.

.4 Maximum Continuous Operating Voltage (MCOV): not less than 125% of nominal system voltage.

.5 The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs).

.6 Protective Modes - The SPD must protect all modes of the electrical system being utilized as indicated in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	Yes	Yes	Yes	Yes
Delta	N/A	Yes	Yes	N/A
Single Split Phase	Yes	Yes	Yes	Yes
High Leg Delta	Yes	Yes	Yes	Yes

.7 Nominal Discharge Current (In): minimum 20 kA.

.8 Voltage Protection Rating (VPR): minimum VPR as follows:

Modes	208/120	480/277	600/347
L-N; L-G; N-6	700	1200	1500
L-L	1200	2000	3000

.9 Shall be maintenance free and without replaceable modules, fuses, etc.

.10 The surge current shall be equally distributed to all MOV components. The surge suppression platform must provide equal impedance paths to each matched MOV.

.11 Shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation shall be up to 50 dB from 10 kHz to 100 MHz.

.12 Monitoring Diagnostics:

.1 Protection Status Indicators:

.1 For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode.

.2 For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.

.3 The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes.

.2 Remote Status Monitor - The SPD shall include Form C dry contacts (one N.O. and one N.C.) for remote annunciation of its status. Both the N.O. and N.C. contacts shall change state under any fault condition.

.3 Audible Alarm and Silence Button - The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

.4 Surge Counter - The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall allow the surge counter to be zeroed. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

.13 All SPDs shall be tested and demonstrate suitability for application within IEEE C62.41 Category C, B, and A environments.

.14 Surge Current Capacity - The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on IEEE C62.41 location category:

Category	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switch-boards, Switchgear, MCC, Main Entrance)	250 kA	125 kA
B	High Exposure Roof-Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

.15 SPD Type - all SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Confirm equipment locations and sizes in electrical and mechanical rooms to ensure equipment will fit.

.2 Install surge suppression equipment integral to electrical equipment. Where SPD must be installed external to assembly, lead length between the breaker and suppressor shall be kept as short as possible. Any excess conductor length shall be trimmed in order to minimize let-through voltage.

.3 Test surge suppression equipment in accordance with UL 1449 Revision 6 & provide test results.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

1.3 EQUIPMENT

.1 Receptacle and switch devices shall be of a single manufacturer.

.2 Acceptable manufacturers: Hubbell, Arrow Hart, Pass and Seymour, Leviton, Bryant.

PART 2 - PRODUCTS

2.1 RECEPTACLES

.1 Duplex receptacles, CSA type, voltage, ampacity, phase as indicated, with following features:
- .1 White urea molded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Eight back wired entrances, four side wiring screws.
- .5 Triple wipe contacts and riveted grounding contacts.
- .6 Ground fault interrupter 5 mA, Class 'A' type where indicated.
- .7 Surge suppressor type where indicated.
- .8 Provide receptacles equal to the following:
  - .1 15 A, 120 V, - Hubbell #5262.
  - .2 20 A, 120 V, - Hubbell #6331.
  - .3 Ground fault - Hubbell #GF5252-W.
- .9 Specification grade.

2.2 COVER PLATES

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

.2 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.3 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

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

.5 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.3 TELEPHONE, DATA & CABLE TV OUTLET

.1 Provide 100 x 100 mm outlet box c/w plaster ring and 21 mm EMT to accessible ceiling space at indicated locations.

.2 Coverplates to be provided by respective companies or as specified in other sections.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 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 00 - Common Work Results for Electrical or as indicated.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.2 Coverplates:
- .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 coverplates meant for flush outlet boxes on surface-mounted boxes.

.3 Provide weatherproof devices as indicated.

.4 Install service poles to manufacturers recommendations and secure to ceiling and floor. Make electrical connections and test.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA).
- .1 CSA C22.2 No. 141-15 (R2020), Emergency Lighting Equipment.
- .2 CAN/CSA C860-11 (2020), Performance of Internally Lighted Exit Signs.

.2 International Organization for Standardization (ISO)
- .1 ISO 3864-1:2011, Graphical symbols - Safety Colours and Safety Signs - Part 1: Design Principles for Safety Signs and Safety Markings.
- .2 ISO 7010:2019, Graphical Symbols - Safety Colours and Safety Signs - Registered Safety Signs.

PART 2 - PRODUCTS

2.1 FINISHES

.1 Light fixtures to be factory primed and painted after fixture construction.

2.2 LUMINAIRES

.1 Provide light fixtures as per fixture schedule, c/w ballasts, lamps and mounting accessories.

2.3 EXIT LIGHTS

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

.2 Housing: extruded aluminum, white 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 12VDC emergency supply.

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

.8 Provide circuit labels at all exit signs.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide sufficient cable length and/or access panels, to provide access to wiring connections in hard ceiling areas, to the inspection authorities requirements.

.3 Install light fixtures to manufacturers recommendations.

.4 Connect fixtures to indicated circuits and connect exit lights to emergency battery units.

.5 Verify and coordinate location of light fixtures on site with other trades to verify clearances at indicated locations prior to installation.

3.2 LUMINAIRE SUPPORTS

.1 For recessed or surface mounted lighting in suspended ceiling installations, support luminaires independently from ceiling, by means of a minimum of two chain hangers bolted to diagonal corners of the fixture body and secured to building structure in accordance with ESA, Section 26 05 00 - Common Work Results for Electrical and Section 26 05 04 - Seismic Restraint Systems (SRS).

3.3 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.

3.4 TESTING

.1 Verify operation of lighting systems, and controls.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 26 05 00 - Common Work Results for Electrical, all electrical sections, and all other disciplines related to the project.

1.2 PRODUCT DATA

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

.2 Data to indicate system components, mounting method, source of power and special attachments.

1.3 WARRANTY

.1 For batteries, the 12 months warranty period is extended to 120 months, with a no-charge replacement during the first 5 years and a pro-rate charge on the second 5 years.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Supply voltage: 347V or 120V, ac.

.2 Output voltage: 12 V dc.

.3 Operating time: 30 minute at rated load c/w 10% spare capacity.

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

.5 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.

.6 Solid state transfer circuit.

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

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

.9 Lamp heads:
  .1 Integral on unit or remote: 345° horizontal and 180° vertical adjustment, lamp type: LED 5w, 12V MR16, 100 hr. die cast head, glare free, sealed beam.

.10 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.

.11 Finish: White.

.12 Auxiliary equipment:
- .1 Test switch.
- .2 AC input and dc output terminal blocks inside cabinet.
- .3 Bracket.
- .4 Cord and single twist-lock plug connection for AC.
- .5 Ammeter, voltmeter, low-volts disconnect, time delay relay, DC terminal blocks inside enclosure.
- .6 RFI suppressors.
- .7 Self diagnosis circuitry.

2.2 WIRING OF REMOTE HEADS

.1 Conduit: type EMT.

.2 Conductors: RW-90 type to Section 26 05 21 - Wires and Cables (0-1000 V) - sized in accordance with manufacturer's recommendations, minimum #10 AWG. Larger wire sizes 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.

.4 Measure voltage at most remote light heads and verify voltage drop is not greater than 3%.

- END OF SECTION -