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FIN DE LA SECTION

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For soumission

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 This section applies to electric heaters and control devices/control methods and associated installation
- 1.2 SEISMIC MOUNTING .1 Supply and install all necessary equipment for seismic mounting as described in section 26 10 00.
- 1.3 REFERENCES .1 Canadian Standards Association (CSA International)
CSA C22.2 No.46, Electric Air-Heaters.
- 1.4 SHOP DRAWINGS AND DATA SHEETS .1 Submit shop drawings and data sheets in accordance with Section 01 33 00 - Submittal Procedures and 26 05 00 – Common Work Results For Electrical
- .2 Submit product data sheets for unit heaters. Include:
- .1 Product characteristics.
- .2 Performance criteria.
- .3 Mounting methods.
- .4 Physical size.
- .5 kW rating, voltage, phase.
- .6 Cabinet material thicknesses.
- .7 Limitations.
- .8 Color and finish.
- .3 N/A
- .4 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.
- 1.5 CLOSEOUT SUBMITTALS .1 Provide operation and maintenance data for unit heaters for incorporation into manual specified in 26 05 00 - Common Work Results For Electrical.
- 1.6 WASTE MANAGEMENT AND DISPOSAL .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with Waste Reduction Work plan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by the department's Representative.
- .5 Collect, package and store existing unit heaters for either reuse, recycling or rebuilding and return to recycler in accordance with Waste Management Plan.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS .1 Ouellet Canada, Dimplex/Chromalox, Stelpro Design.
- 2.2 UNIT HEATERS .1 Unit heater with adjustable louvers finished to match cabinet as indicated.
 - .2 Fan type unit heaters with built-in high-heat limit protection, fan-delay switches.
 - .3 Fan motor permanently lubricated ball bearing type with resilient mount and built-in fan motor thermal overload protection.
 - .4 Hangers: as indicated.
 - .5 Elements mineral insulated copper coated stainless steel sheath with continuous helical brazed fins.
 - .6 Cabinet: steel at 1,6 mm thick, treated with phosphate and finished with 2 coats baked enamel paint in beige color or the architect's choice. Fitted with 4 brackets for rod or wall mounting.
- 2.3 CONTROLS DEVICES, REGULATIONS .1 As indicated, provide remote-controlled thermostats or wall-mounted thermostats
 - .2 Built in thermostat and support controls.
 - .3 Wall mounted thermostats following divisions 23 and 25.

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Suspend unit heaters from ceiling or mount on wall as indicated.
 - .2 Install thermostats in locations [indicated].
 - .3 Make power and control connections.
 - 4. For the heating system to work efficiently and conserve energy, it is important to mount thermostats at appropriate locations. The thermostat will respond to the temperature of the wall and surrounding air and it should not be placed in the following areas: on an outside wall, a wall exposed to direct sunlight, near a window or door or near internal heat sources.

- 3.2 FIELD QUALITY CONTROL
- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
 - .2 Test cut-out protection when air movement is obstructed.
 - .3 Test fan delay switch to assure dissipation of heat after element shut down.
 - .4 Test unit cut-off when fan motor overload protection has operated.
 - .5 Ensure heaters and controls operate correctly.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 This section includes requirements common to the various section of the Electrical specifications
 - .2 The list given in this document is not limited and all devices or accessories needed to complete installation must be provided and installed by the contractor even if they are not specifically described.
 - .3 In case of disagreement or inconsistency between documents, the most restrictive clause will be given priority.
- 1.2 REFERENCES
- .1 Unless otherwise stated, wherever there is mention of a code or standard of the tender documents, use the latest edition at the moment more recent to amendments
 - .2 Provincial Labor Standards codes and regulations.
 - .3 Building regulations, zoning and provincial codes.
 - .4 Applicable regulations for Environmental Protection Services of the Ministry of Municipal Affairs.
 - .5 Perform all the installation according to the Quebec Construction code – Chapter V – Standards of Electricity and Hydro Québec
 - .6 All equipment, installation and testing must comply with standards, codes or regulations of the Federal, Municipal and Provincial Government.
 - .7 All equipment, testing and quality assurance must comply with standards and codes of the following associations:
 - Canadian Standards Association (CSA International)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1 (current Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2.
 - .3 CAN/CSA-C22.3 no.1 Overhead Systems.
 - .4 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .5 CSA C22.10-10, Québec Construction Code Chapter V- Electricity.
 - .6 CSA-B651-04, Accessible design for the built environment.
- And all Québec Regulations and Recommendations
- AMEEC:** Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

EEMAC 2Y-1, Light Gray Color for Indoor Switch Gear.

ANSI: American Electrical Manufacturer's Association

IEEE: Institute of Electrical and Electronics (IEEE) /National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms

ICEA: insulated Power Cable Engineers Association.

1.3 DEFINITIONS

.1

Specific terms:

A verb in the infinitive form, beginning a sentence or a proposition to imply words (contractor shall provide, install and connect...) ex: provide and install or provide and place... means (contractor shall provide, install and connect all material.

« **ELECTRICITY** » in the header for plans and specs relates to the field of « Electricity ».

« **PROVIDE** » means to supply install and connect.

« **ACCORDING TO INSTRUCTIONS** » means indicated on the plans and specifications as part of the contract.

« **SPECIFICATIONS** » means collectively all the latest revisions attached to this specification and the revised or additional drawings that will be provided later.

« **IN THIS SPECIFICATION** » means the contents or a section or division in which this term appears.

The terms « **CONTRACTOR** » or « **CURRENT CONTRACTOR** » or «**SPECIALIZED CONTRACTOR**», mentioned in different sections of the specs and plans in the Electrical section, means the contractor in charge of or responsible for the specs and plans in which they appear.

.2

Electric and Electronic Terms:

Unless otherwise indicated, the terminology used in the section of the specs and plans is based on that defined in the standard IEEE SP1122.

1.4 REVIEW OF PLANS, SPECIFICATIONS AND LOCATIONS

.1

Before delivering its bid, the bidder must visit the site and surrounding areas, to become familiar with everything that could affect the work in any way whatsoever. No claim due to ignorance of local conditions will be recognized by the owner

.2

The bidder shall carefully study the plans and specifications for structural, architectural and other specialties to ensure that the work

of this contract may be executed in a satisfactory manner, as shown on the plans. Before starting work, review the work of other specialties and report to the department's representative of any defects or impede the execution of the work described in this specification or affecting the security required.

.3 These reviews by the Contractor shall be made in order to coordinate the execution of its work. The Contractor shall interpret the documents in line with the strictest requirements.

.4 No allowance will be granted to the contractor for the consequences of his failure to make such examinations.

1.5 PLANS AND
SPECIFICATIONS

.1 All contract documents complement each other and any instructions found in one of them is enforceable as if it is found in all documents.

.2 The plans serve only to guide the contractor and subcontractors on the number and approximate location of the conduits, receptacles, lighting or other.

.3 For purposes of enforcement in the event and an obstacle to overcome, the location of pipes, cables, lighting fixture or other equipment can be moved within (3) meters from the location indicated without additional charge.

1.6 DESIGN REQUIREMENTS

.1 The operating voltages shall conform to CAN3-C235

.2 Motors, electric heaters, devices command / control / regulation and distribution must operate in a satisfactory manner at a frequency of 60 Hz and within the limits established in this standard.

.1 Equipment must be able to operate without sustaining damage under extreme conditions identified in this standard.

.3 All electrical equipment must also operate within the conditions of supply of electricity from the power company.

.4 In any event, the equipment must operate normally with minimal variation of voltages 15% and 10% of the nominal voltage of equipment.

.5 Operating language and display: provide identification and display of signs and tags in French for control devices / control.

.6 All electrical equipment located in an electrical equipment room, protected by sprinklers, must conform to with Article 26-008 "Apparatus protected by sprinklers" of the Quebec Construction Code, Chapter V - Electricity.

List limited to major appliances covered by this article:

– Connection Center.

- Distribution Panel.
- Transformers.
- Motor Control Centers.
- Main distribution centers (substation).
- Control Relay.
- Isolating switches.
- Starter motors and variable frequency drive.
- Two control.
- Centre for power factor correction.
- Generator and transfer switch.

1.7 MATERIAL REQUIREMENTS FOR ESTABLISHMENTS

- .1 To maintain consistency, use only products from one manufacturer when it comes of material or equipment of the same type or class and, unless otherwise indicated.
- .2 Follow manufacturer's recommendations in regard to security, opportunities, access, maintenance and repairs.
- .3 Ensure maintenance and dismounting can be done without injury to the elements of the building or other facilities.
- .4 Provide means to access the hardware, for maintenance purposes.
- .5 Where possible, align the edges of pieces of equipment with the building walls.

1.8 RESPONSIBILITY FOR THE TRIAL TESTING

- .1 Protect the work against loss or damage until its acceptance.
- .2 During the temporary use, the warranty period will not be affected.
- .3 The owner can use the facilities and equipment for testing before they have accepted. Provide labor, equipment and instruments required for testing.
- .4 Clean and refurbish and leave in good working the facilities and equipment used before their acceptance and isolate equipment that could be damaged.
- .5 Prevent dust, dirt and other foreign matter from entering openings of facilities and equipment during installation and temporary use.

1.9 CONCEALED WORK

- .1 No work shall be concealed without approval.
- .2 In the event that the specialty contractor breaches this clause, this

one may be forced to discover the concealed work. The costs incurred will be the responsibility of offender, that the work is well executed or not.

1.10 DOCUMENTS AND SAMPLES.1

Submit documents and samples in accordance with this section and section 01 33 00 – Submittal Procedures.

.2 N/A

.3 Submit, for review, the single line diagrams framed under glass or Plexiglas, and place in areas below:

.1 Electrical Distribution network: at the main electrical installations.

.2 Network production and distribution of electricity: in the local generators.

.4 Provide, for review, a vertical distribution plan of the fire alarm system that show plan and zoning of the building, framed under glass or Plexiglas, and place it near the control panel and fire alarm annunciation panel.

.5 Shop drawings

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that must be provided to show in detail a portion of the work

.2 The drawings submitted, where required, must be signed by an authorized qualified engineer or entitled to practice in Canada, in the province of Quebec.

.3 The Contractor shall make the necessary steps for the preparation of shop drawings as required by the contract documents or the department's representative may reasonably request. These drawings must, show only the devices, materials, systems, etc., Project-specific. Drawings should be arranged to release a minimum clearance of 75 mm x 75 mm (3 in. x 3 in.) to allow the department's representative to affix the stamp of review.

.4 Wiring diagrams and installation details of equipment must indicate the location, layout, capacity, weight, route and proposed layout, control panels, accessories, piping, ducts, details of stands, brackets, bolts and all other elements that must be displayed to ensure that we can achieve a coordinated installation.

.5 Wiring diagrams shall indicate the circuit terminals, the internal wiring of each unit as well as interconnections between devices, and structures within other disciplines.

.6 The drawings shall indicate clearances required for the

operation, maintenance and replacement of equipment.

- .7 Before placing orders for materials, submit to the department's representative, for verification, one (1) electronic copy (PDF file) of the shop drawing of the equipment chosen. An electronic copy will be returned to the contractor. Other copies required will be prepared and distributed by the Contractor from the copy reviewed by the department's representative.
- .8 Do not undertake work until you receive written notice from the department's representative certifying the review of the submitted drawings.
- .9 Include all drawings of any chart, graph, detail, description, sample (if required by the department's representative), to check the appearance, quality, performance, durability of the equipment chosen.
- .10 The drawings submitted must be identified for this specific project. They must indicate the project name, the name of the department's representative, contractor, date and refer to an item number of the specs or a detail in the plans.
- .11 Check in advance these drawings prior to submission to the department's representative. Check dimensions on site. Ensure the installation criteria and catalogue numbers. If changes are required, inform the department's representative before they are made.
- .12 The review of the department's representative is limited to monitoring compliance with shop drawings and conceptual studies the general layout. This review does not absolve the Contractor from responsibility for errors or omissions in shop drawings or his responsibility to comply with all requirements of contract documents and site conditions, unless exemption clearly indicated on shop drawings have been approved in writing by the department's representative.
- .13 The Contractor shall provide shop drawings with all corrections and modifications as the department's representative requires in accordance with the Contract Documents and resubmit unless the department's representative in the exemption.

When re-submitting shop drawings, the contractor must inform the department's representative in writing revisions, other than those requested by the department's representative, which have been made.
- .14 Do not distribute copies of the drawings submitted until receipt of written notice of revision from the department's representative.

- .15 The study of coordination, where required, must be issued simultaneously with shop drawings. Any issue will delay even more the review of drawings by the department's representative.
- .16 Shop drawings must be in French.
- .6 Quality Assurance: in accordance with Section [01 45 00 - Quality Control].
 - .1 Provide equipment and materials that are CSA approved.
 - .2 In cases where we can get equipment and materials CSA certified, submit the proposed equipment and materials to the competent authority and the inspection authorities, for approval, before delivering them to the site and to defray costs.
 - .3 Submit the test results of electrical systems and instruments installed in the form of a written report.
 - .4 Permits and fees: under the general conditions of contract, and this section.
 - .5 Once completed, submit a report of load balancing in accordance with article "Quality control on site" in Part 3 of this section.
 - .6 Once completed, submit to the department's representative the certificate of approval issued by the competent authority.
 - .7 Molded Case Circuit Breakers
 - .1 The contractor, electrical subcontractor must deliver to the department's representative a certification of the authenticity of all molded case circuit breakers used in the project and before any installation thereof to the site.
 - .2 The certificate must indicate at least the following information:
 - Name of the electrical contractor
 - Project identification and address of site installation
 - The brand, the electrical characteristics of circuit breakers for circuit breakers and 60A and the serial number.
 - The name and signature of the authorized distributor for the manufacturer who supplied the circuit breakers.

- The number of circuit-breakers at licensed dealer.
 - The signature of the local representative of the manufacturer.
- .7 In case reports of controls must be made by the manufacturer to the department's representative : within three days after the checks and tests the installation and electric instruments prescribed in Article FIELD QUALITY CONTROL, PART 3 of this section, a written report of the manufacturer showing that the research meets the criteria specified.
- 1.11 INTERFERENCE SCHEMATICS
 - .1 If necessary, prepare schemes to ensure that electrical equipment can be mounted in space and where indicated without disturbing the other sections and equipment while leaving space for the proper maintenance of these equipment.
 - .2 If a department's representative considers that there may be interference in a particular location; they may require the Contractor to prepare plans of interference of these places.
- 1.12 SPECIFIC PRODUCTS
 - .1 When more than one brand of product is specified in the plans and specifications, we will strictly stick to these brands for the submission and delivery. The bidder will be chosen on the assumption that its bid is based on the products specified in plans and specifications.
 - .2 In the case where there is only one brand of product indicated in the plans and specifications; this brand becomes the only brand to the specified product. No other acceptable product will be accepted.
 - .3 Analysis by the department's Representative
 - .1 Among the brands of products specified in plans and specifications, any application for equivalence submitted to the department's representative of the contractor will be considered taking into account the following criteria: construction, performance, capacity, dimensions, weight, size, minimum standards, availability of spare parts, maintenance problems, delivery times, existence of similar equipment and proven in service.
 - .2 When such a request is made, it is incumbent upon the contractor to demonstrate in tabular form confirming the parallel between the specified product and proposed product from other brands. Without limitation, it will confirm among others: the size, weight, clearances required for maintenance, operating voltage, power consumption, the starting current, operating conditions, performance the list of accessories, etc.
 - .1 In the case of lighting, the Contractor shall provide, in addition, photometric calculations AGI32 format and

the IES file used for calculations.

- .3 Upon verification of the evidence, the department's representative will make recommendations to the owner and any required control equipment or piece of equipment will be placed prior to obtaining authorization.
- .4 If the components and / or characteristics of products offered other brands specified differ from each other, the contractor will be liable to and shall, at its expense, pay the cost of alterations and additions of equipment or materials and additional, for all trades so that we find for each of them the same functions.
- .5 Following the refusal of his first proposal, if the contractor had to submit other proposals for the same equipment or material, he shall pay directly to the department's representative of the additional fees incurred for these additional checks at its own expense and bear the costs of delays in the work entailed for these additional checks.

1.13 QUALITY ASSURANCE

- .1 The Contractor shall have full control of his own work including those of the subcontractors.
- .2 The Contractor shall direct and supervise the work adequately in order to ensure compliance with plans and specifications.
- .3 The Contractor shall be solely responsible for the methods, techniques and sequences for carrying out the work.
- .4 The contractor must have a site supervisor that can represent him in his absence. Any notice, order, direction, etc. given to the supervisor shall be construed as given to the contractor himself.
- .5 The Contractor shall ensure that its work will be done promptly before pouring concrete or performing other similar work. Supply and install sleeves required. If it is necessary to cut or repair work completed or not, to use his own expense, a specialist in the part of the work involved making cuts and repairs.
- .6 If the materials supplied by the Contractor must be incorporated into the work of other contractors such as masonry, carpentry or plastering, the contractor will be responsible for providing the equipment and to incorporate measures for necessary openings to develop.
- .7 If the Contractor covers or permits to cover work before tests and inspections have been made, the Contractor shall, upon request, uncover the work in question, to complete the inspections and tests in a satisfactory manner and deliver such part of the work in the condition at the contractor's own cost.
- .8 The Contractor shall protect his own work, finished or unfinished, and that of other contractors against any damages resulting from the

- execution of his own work. Cover floors, etc., as needed with heavy fabric. Repair, without cost and to the satisfaction of the department's representative, all damages on floors or other parts of the building resulting from the execution of his own work.
- .9 When the work is completed, all tools, surplus materials or waste will be removed and the premises will be left perfectly clean.
 - .10 Quality Assurance: according to Section 01 45 00 - Quality Control.
 - .11 Qualification: electrical work must be performed by authorized, qualified by a master electrician or an electrical contractor holding a license issued by the province in which the work will be performed or by apprentices in accordance with the relevant authorities and in accordance with the terms of provincial legislation concerning territorial vocational training and qualification of the workforce.
 - .1 Employees enrolled in a provincial apprenticeship program can perform specific tasks if they are under the direct supervision of a qualified licensed electrician.
 - .2 Tasks permitted: depending on the degree of training and according to the demonstrated ability to perform specific tasks.
 - .12 Site meetings
 - .1 in the case where site meeting are made by the manufacturer as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, in appropriate NMS Section , schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
 - .13 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- 1.14 DELIVERY, STORAGE AND HANDLING
- .1 Material Delivery Schedule: provide the department's Representative with schedule within [2] weeks after award of Contract.
 - .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .3 Materials must be delivered and stored according to manufacturer's instructions and ensure that their labels and seals are intact.
 - .4 Ship and store in a standing position, the equipment to assemble.
 - .5 Ship sections and assembly anchoring patterns before hardware.
 - .6 Close the doors of the equipment and keep them locked. Protect equipment against damage and dust.
 - .7 If necessary, shim moving parts to avoid damage when moving or shipping the material. The guidelines for the removal of wedges before commissioning should be displayed in French clearly and prominently.
 - .8 Store electrical equipment inside unless otherwise indicated.
- 1.15 SYSTEM STARTUP
- .1 In accordance with section 01 91 13.
 - .2 Instruct the department's Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
 - .3 Provide written notice of 5 working days of the date of testing.
 - .4 All equipment as well as the various systems, must be turned on, adjusted and calibrated by the contractor so as to provide the capacity and performance required of plans and specifications.
 - .5 perform startup tests in the presence of the people responsible and the owner's representative.
 - .6 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.
 - .7 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.
- 1.16 OPERATING INSTRUCTIONS
- .1 Submit three (3) copies (unless otherwise indicated) of the operations manual and maintenance in binders identified for this purpose. These manuals will consist of a hardcover three-ring and identified with "P-Touch" on the front cover and the vertical side.
 - .2 Operating instructions to include following:
 - .1 The details of the components, construction features, function and maintenance requirements of the various components to facilitate the starting, operation, maintenance, repair, alteration, extension and expansion of or any part characteristic of the installation.
 - .2 Technical data and product characteristics must be accompanied by supplementary information such as

		newsletters, illustrations and exploded views of component parts, technical descriptions and parts lists. The flyers advertising or brochures are not accepted.
	.3	Wiring diagrams, circuit diagrams, control sequence for each main system and for each device, the principle diagrams and yield curves, startup procedures, adjusting, adjustment, lubrication, operation and stop, security measures, procedures to follow in case of failure, and other instructions, as recommended by the manufacturer of each body system.
	.4	The names and addresses of the local suppliers of products mentioned in manuals.
	.5	A copy of each shop drawings revised with comments made to them for approval and changes during construction.
	.6	Warranties, factory test reports, verification certificates, certificates of circuit breakers, etc.
	.7	Data sheets must be in French.
	.8	The entire manual should be in electronic (Autocad (latest version), Word, Excel or Acrobat (PDF)).
	.9	All drawings and / or drawings types used in the Autocad format will also be provided in electronic DWG format.
	.3	Provide tools, equipment and services of qualified instructors for the training of operating personnel and maintenance for the operation, the control, adjustment, diagnosis of problems and maintenance of all systems and equipment, during normal hours of work and before acceptance and delivery of systems and equipment.
	.4	When other additional requirements specifies this, manufacturers must carry out demonstrations and train staff according to the requirements for training hours specified in each relevant section.
	.5	Training courses should be based on the contents of the operations manual and maintenance and as-built drawings.
1.17	<u>SOFTWARE AND COMPUTER DATA</u>	.1 With all equipment provided with a processor whose parameters are programmable, the Contractor shall provide the owner of software programming and settings stored in the memory of the equipment. Training on the equipment in question should also cover how the software works.
1.18	<u>RIGHTS, PERMITS AND INSPECTION</u>	.1 Submit to the authorities concerned, the required number of copies of drawings and specifications to enable them to study and approve before work begins.
		.2 Pay all related costs.

- .3 The contractor is responsible to apply for connection to the electricity distributor.
- .4 If applicable, drawings and specifications required by the authorities will be provided directly by the department's representative to cost to the contractor.
- .5 At the end of the work, provide the required certificates, including a copy to the department's representative. Pay all charges for additional copies required by the authorities concerned.

1.19 SPECIFIC REQUIREMENTS
– COMMISSIONING

- .1 In addition to the requirements mentioned in sections of the discipline "Electricity", the Contractor shall collaborate with the department's representative to meet the requirements of the commissioning plan, Section 01 91 13

PART 2 - PRODUCTS

2.1 MATERIALS AND
EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Control panels and component should be factory assembled.
- .4 Provide materials, equipment and new sets of design and of known quality, recent model, whose characteristics are known and which replacement parts are available upon request.
- .5 Control panels and components shall be factory assembled.
- .6 Unless otherwise specified, to maintain consistency, use only products from one manufacturer when it comes to material or equipment of the same type or class.
- .7 Follow manufacturer's recommendations in regard to safety, inspection doors, maintenance and repairs.
- .8 Ensure the maintenance and dismantling may be done without hindering to the elements of the construction or other installations.
- .9 Provide means for accessing material, for maintenance purpose.
- .10 Wherever possible, align the edges of pieces of equipment as well as other items with walls of the building.
- .11 Check the joints made in the factory and tighten if necessary to ensure continuity of installation.
- .12 Identify and comply with manufacturers' recommendations regarding

storage and hardware installation.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Check responsibilities regarding installation and coordination with regard to motors, equipment and command / control, as indicated. Unless otherwise specified, starters and starter centers are supplied and installed by the discipline "Electricity". Section of mechanics, supplies and installs engines and equipment under its discipline.
- .2 Unless otherwise specified in the plans, the control wiring and conduit will be provided related discipline under "Electricity", with the exception of ducts, wiring and connections operating at voltages below 120 V and related systems control prescribed in sections for mechanical systems and on the drawings of mechanical systems.
- .3 Ensure that the phase sequence is adequate for the driving forces and have a direction of rotation in the clockwise direction.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of inspection authorities and the department's Representative.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: Unless otherwise specified, use plates made of plastic lamicaid 3 mm (1/8 inch) thick, mechanically fastened using self-tapping screws with engraved inscription in white on black for the normal network, in white on red for emergency panels and equipment connected to the emergency equipment and for fire alarm, white on orange panels for computer and related equipment and white on blue for uninterruptible power supplies (UPS), signs and any other equipment serviced by UPS.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters _

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by the department's Representative prior to manufacture.
- .4 Allow for minimum of twenty-five 25 letters per nameplate and label.
- .5 The nameplates of terminal boxes and junction boxes must indicate the characteristics of the network and / or voltage, identification, and the circuit panel from which the supply and indicate what is being fed downstream (after).
- .6 Instructions must be in French.
- .7 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .8 The nameplates of terminal boxes and junction boxes must indicate the characteristics of the network and / or voltage, identification, and the circuit panel from which it is fed and indicate what is fed downstream (after).
- .9 The transformer nameplates shall indicate the identification, the panel and the circuit from which the power is supplied, numbers of circuits and the panel which is supplied by the transformer.
- .10 Nameplates on junction box and fire alarm should indicate network characteristics: fire alarm detection.
- .11 Side panels 120/208 V and 120/240 V and 347/600 V:
 - .1 For new projects, the contractor must identify the circuit breakers used in referring to the numbers on the doors of the premises. Panels on the cards, identification of the file should appear (name of panel-year-month-day.XLS), each panel must have a Excel file. At the end of the project, the Contractor shall deliver them to the department's identified the computer files.
 - .2 For existing panels, the contractor should note that each sheet panels affected will be updated either by computer or legible handwriting.
- .12 Electrical Appliances
 - .1 All panels, disconnects, fuses, junction boxes and pull, starters, center starters, contactors, each circuit of the main panels and other equipment provided by this division will all wear a name plate engraved in white lamicoid on black or red background for emergency, according to the formats given in section 2.6.1.2 of this section. This identification will correspond to the date shown on the plans.

- .13 Fire alarm equipment
 - .1 All junction cabinets and fire alarm pulling cabinets will all wear a name plate engraved in red white lamicaid according the formats given in section 2.6.1.2 of this section. This identification will correspond to the date shown on the plans or as described in section 2.6.10 of this section.
 - .2 Identify all elements of detection, triggers, modules as described in Section 28 31 00.01 - Addressable Fire Alarm System.
- .14 List of formats nameplates to use:
 - .1 Main service chart: 7
 - .2 Junction box, pulling box: 5
 - .3 Automatic diverter: 7
 - .4 Meter, alarm: 5 / fusible: 2
 - .5 Switch: 5
 - .6 Magnetic starters: 5
 - .7 Manual starters: 5
 - .8 Main breaker: 5
 - .9 Generator: 7
 - .10 Pilot-light: 5
 - .11 Control panel: 7
 - .12 Motor control center: 7
 - .13 Breakers: 5
 - .14 Transformers: 5
 - .15 Junction cabinets and fire alarm pulling cabinets : 2
 - .16 Panel board
 - .17 Switch gear 25 kV: 7
 - .18 UPS (uninterrupted power supply): 7
 - .19 Unit 125 V DC: 7
 - .20 Control panel and electrical management: 7
 - .21 Motors: 5

- .15 Control Panel
 - .1 Within each of the main panel and on the gutters, the identification phase "A", "B", "C", "N", will be affixed with letters of 50 mm (2 in.) high minimum.
- .16 Motors
 - .1 For each motor, make marking on the motor identifying the isolating device and its location and the starter or the engine controller.
- .17 Boxes
 - .1 All junction and pulling boxes used for branch circuits shall be identified as follows: number of electrical panel and circuit numbers. Registration shall be enforced by an adhesive tape-type P-Touch.
- .18 Systems
 - .1 All boxes of the different systems must carry the name of the system (eg telephone, computer).
- .19 Sockets and switches
 - .1 Each outlet and switch shall bear the following identification: no. panel and no. circuit.
 - .2 The low voltage switch must bear the following identification: No. of panel relay, No. Relay on another line and have no. panel and no. circuit.
 - .3 The identification will be as follows: P-Touch (electronic lettering machine type P-Touch) c / w self adhesive strip under pressure effect of 12 mm wide No. TC-201.

The adhesive tape will do the complete opposite of the plate and part of the back so that the band does not come off. Before sticking the tape, clean the plates of all impurities.
 - .4 The colors will be as followed:

Normal: Black letters with clear background

Urgency: Red letters with clear background

U.P.S.: blue letters on clear background
 - .5 In addition, the Contractor shall install an identification P Touch adhesive on the device itself, but in the back of the plate and fold behind the ear devices outlets and switches. This identification will be the same as on the plate (No. panel and No. circuit).

- .20 Emergency lighting, exit sign, battery lighting, fire alarm, etc.
- .1 All appliances must carry the following markings: No. panel and No. circuit, the text will be white on red.
- 2.6 WIRING IDENTIFICATION
- .1 Identify wiring with permanent indelible identifying markings, numbered and colored plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and color coding throughout.
- .3 Color coding: in compliance with Code de Construction du Québec, chapter V- Electrical.
- .4 Use color coded wires in communication cables, matched throughout system.
- .5 In each panel, in all junction boxes, each conductor (including neutral) will be identified by the (No. panel and No. circuit) or its function (alarm circuits 1, 2, 3, etc..) by using ring-marks *Thomas Betts* brand.
- 2.7 CONDUIT AND CABLE IDENTIFICATION
- .1 Color 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 Colors: 25 mm wide prime color and 50 mm wide auxiliary color. These bands will be brand "*Thomas & Betts*" EZ series strips of identification Code
- | | Prime | Auxiliary |
|-----------------------------|--------|-----------|
| up to 250 V | Yellow | |
| up to 600 V | Yellow | Green |
| up to 5 kV | Yellow | Blue |
| up to 15 kV | Yellow | Red |
| Telephone | Green | |
| Other Communication Systems | Green | Blue |
| Fire Alarm | Red | |
| Emergency Voice | Red | Blue |
| Other Security Systems | Red | Yellow |

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| | .4 | In addition to the color code, each main distribution systems, main roads, secondary electrical distribution, telephone distribution line, will be given an identification vinyl (plastic) attached by stainless steel fasteners at every 15 m and at points of cross walls, ceilings and floors. |
| | | Entries will be according to the designations given to plans. |
| | .5 | Plastic cards of 50 mm x 150 mm perforated around and fastened with "TY-RAP" fasteners. |
| 2.8 <u>FINISHES</u> | .1 | Comply with the requirements of the architect. The color of all electromechanical equipment is apparent in the choice of the architect in the range of all standard colors and non-manufacturer standards, including special colors. |
| | .2 | Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel. Paint outdoor and indoor electrical equipment switchgear and distribution enclosures light gray ASA-61 to EEMAC 2Y-1. |
| | .3 | Clean and touch up the painted surfaces in the workshop that were scratched or damaged during shipping and installation. Use a paint that matches the original painting. |
| | .4 | Clean and prime the hooks, brackets, fasteners and other devices visible, not galvanized to protect against rust. |

PART 3 - EXECUTION

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|--|----|--|
| 3.1 <u>INSTALLATION</u> | .1 | Do complete installation in accordance with Code de Construction du Québec, chapter V- Electrical. |
| 3.2 <u>NAMEPLATES AND LABELS</u> | .1 | Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed. |
| 3.3 <u>OPENING AND CROSSING OF ARCHITECTURAL AND STRUCTURAL ELEMENTS</u> | .1 | Make the necessary arrangements for openings in the roof and exterior walls are equipped with flashing and protected against the elements. Coordinate the requirements of this section with those of the Division 07 - Thermal and Moisture. |
| | .2 | All work described below for the installation of sleeves, openings or closing of openings in an existing building and new construction will be implemented by: <ul style="list-style-type: none"> • The electrical contractor, except openings indicated on the plans of structure and / or architecture. |

- .3 The work of opening foundations includes any drilling, casing, floors and interior walls as well as all drilling required for installation of equipment, piping and their supports, inserts, bolts, etc.
- .4 As recommended by the architect, not all existing openings reused must be sealed, made watertight and / or flame retardant composition to make them equivalent to the element passed through.
- .5 Place the sleeves where pipes go through masonry or concrete, or structures listed for their fire resistance.
- .6 All sleeves, inserts, bolts, etc., Will be installed before the walls and floors are constructed and the concrete is poured.
- .7 Use as sleeves of steel pipe, Schedule 40 with anchors set in the center, Ø 12 mm above the pipes. Steel sleeves welded 16 gauge, may be used only when the required internal diameter of the sleeve will not match a standard diameter schedule 40 pipe. Apply prior to installation, a coat of paint dry zinc (product accepted: Sico "Corrostop").
- .8 When using plastic sleeves for penetrations of walls or floors with a degree of fire resistance, remove them before installing the ducts.
- .9 Install cables, conduits and fittings to be embedded or plastered neatly against the building structure so as to minimize the thickness of fur.
- .10 Openings and materials must be of sufficient size for the installation of thermal and acoustical insulation and should allow for thermal movement. Openings and sleeves shall be completely independent ducts to be subsequently installed.
- .11 If an additional piercing is required, it may occur after it has requested and obtained written permission from the owner and / or his representative and / or consultant in structure.
- .12 The piercing of the holes by air hammer or electric vibratory action as well as the drilling by hand and any other means by mechanical shocks are prohibited. The holes should be drilled using a rotary drill with water or other device approved by the consultant structure.
- .13 For crossings of the exterior walls and watertight basins, using sleeves with flange secured to the center by continuous welding.
- .14 Dimensions: leave an annular gap of at least 12mm between the sleeve and the pipe without insulation or between the sleeve and the insulation.
- .15 Lay the sleeves so they are flush with the surfaces of concrete and masonry and concrete floors poured directly on the ground that they exceed 50 mm all other types of floors.
- .16 The Contractor shall fill all the gaps around ducts using prefabricated seals when the sleeves pass through foundation walls, exterior walls,

- concrete walls, the walls of watertight basins and slabs with waterproof membrane. Acceptable products are of the type "link seal".
- .17 In the case of passing through walls or floors rated for fire resistance; see item 3.4 in the present section.
 - .18 Any piercing of the enclosure of the building floors or interior walls should be sealed as directed by the architect to maintain quality of the soundproofing, insulation and / or fireproofing. The architect may apply to products other than those proposed in the previous sub-sections. The specialist contractor shall comply with the approval and the final decision of the architect.
 - .19 Any piercing in steel beams must be coordinated between the contractor and the contractor specialized in structure and final details will be specified on shop drawings in structure according to specific needs.
- 3.4 FIREPROOFING .1 Where cables or conduits pass through floors and firewalls. The fire stop materials will be branded "INSTANT FIRESTOP INC". (I.F.S.) or other acceptable product. The Contractor shall require the supplier of fire stop materials, technical bulletins corresponding to fire stop materials for use with the ULC listing number (SP) corresponding to the assembly which will be performed on site.
- 3.5 SOUNDPROOFING .1 Unless otherwise indicated in accordance with the requirements in Section 07 92 10 - Joint Sealing, fill all the spaces left free between the sleeves and / or conduits and walls and / or floors with wool acoustic low density and seal the periphery of each side with an acoustic sealer silicone.
- .2 Once all conductors are installed and for all empty conduits, seal on each side of openings of the conduits with low density acoustic wool to a depth of 50 mm. Install the latter so as to remove for the passage of other drivers.
- 3.6 LOCATION OF OUTLETS .1 Locate outlets in accordance with Section [26 05 32 - Outlet Boxes, Conduit Boxes and Fittings].
- .2 Do not install outlets back-to-back in wall; allow minimum [150] mm horizontal clearance between boxes.
 - .3 Change location of outlets at no extra cost or credit, providing distance does not exceed [3000] mm, and information is given before installation.
 - .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.
- 3.7 MOUNTING HEIGHTS .1 Mounting height of equipment is from finished floor to centerline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify

with the department's Representative before proceeding with installation.

- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1 200 mm.
 - .2 Wall receptacles:
 - .1 General: 450 mm.
 - .2 Above top of counters or counter splash backs: 175 mm.
 - .3 In mechanical rooms: 1 200 mm.
 - .3 Panel boards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 450 mm unless otherwise indicated under cabinets.
 - .5 Wall mounted telephone and interphone outlets: 1 200 mm.
 - .6 Fire alarm stations: 1 200 mm.
 - .7 Fire alarm bells: 2 300 mm and at least 150 mm from the ceiling.
 - .8 Television outlets: 450 mm.
 - .9 Wall mounted speakers: 2 100 mm.
 - .10 Clocks: 2 100 mm.
 - .11 Door bell pushbuttons: 1 200 mm.
- .4 The height of installation must comply, throughout a path without obstacles served by an elevator or elevating device platform for passengers from the entrance to any area of a floor of a public building, to the following premises except for any local technical and other listed NBC (2 3.8.2.1). The locations will coordinate before any work with the architect.
 - .1 Switches and dimmers: 1 200 mm.
 - .2 Doorbell buttons: 1 200 mm.
 - .3 Intercoms: 1200 mm.
 - .4 Fire alarms stations: 1 200 mm.
 - .5 Wall outlets (telephone, power, etc.): 540 mm.

3.8 PROTECTION

- .1 During construction, protect the exposed and live material to ensure staff safety.

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| | .2 | Enclose and mark live (energized) parts by the inscription "live circuit 120 volts" (or the appropriate voltage), in French. |
| | .3 | Provide for the installation of temporary doors to close the rooms containing electrical distribution equipment. Keep these doors locked except when the electrician provides direct supervision. |
| 3.9 COORDINATION
OF PROTECTIVE
DEVICES | .1 | The Contractor shall conduct a study of coordination. Note that the study should be sent to the department's representative along with shop drawings. This study must include all the curves on logarithmic paper showing coordination between existing protections at connections between devices and protection of electrical installations covered by this estimate. |
| | .2 | The Contractor shall obtain approval for the study of coordination by the department's representative. |
| | .3 | When the study is approved, the contractor must make the adjustment and installation of all protective devices such as triggers overcurrent relays and fuses. The Contractor shall recheck and make sure that all these adjustments are set to values required before powering various devices. |
| 3.10 FIELD QUALITY CONTROL | .1 | Make the following tests and pay all costs |
| | .1 | Load Balance: |
| | .1 | Measure phase current to panel boards 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 - SUBMITTALS: phase and neutral currents on panel boards, dry-core transformers and motor control centers, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test. |
| | .2 | Conduct following tests in accordance with Section 01 45 00 - Quality Control. |
| | .1 | Power generation and distribution system including phasing, voltage, grounding and load balancing. |
| | .2 | Circuits originating from branch distribution panels. |

- .3 Lighting and its control.
- .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .5 Any other system: Fire alarm system, communication network, monitoring of doors, intrusion, etc. by specialized firms.
- .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of the department's Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Submit the test results to the department's representative in the form of a written report.
- .6 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .7 Tests
 - .1 Make tests to check that no wires or circuit does not contain a ground. Also do with the acting the department's representative, tests to prove that connections are made everywhere and offer no resistance, such a voltage drop exceeding 3% when all appliances are in use.

Finally, balance the lighting circuits on the tables and side tables so that the main phases of the building are perfectly balanced.
- 3.11 CLEANING .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

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| | .2 | Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting. |
| | .3 | Clean all duct systems and their boxes before pulling conductors. |
| | .4 | Clean the inside of all boxes of wiring devices and lighting fixtures and heating systems special. |
| | .5 | Prior to commissioning, clean all equipment, panels, transformers, starters, etc..., Their control panel and accessories. |
| | .6 | When the final cleaning, cleaning of the reflectors, diffusers, globes and other lighting products that have been exposed to dust and dirt. |
| 3.12 PLANS «WITH CONSTRUCTION ANNOTATIONS» | .1 | During the execution of the work, to record all changes on a copy of site in red. |
| | .2 | At the end of the work, transcribe all the changes in red color legibly on a clean copy. Identify each plan in the lower right corner in letters at least 12 mm high, as follows: "CERTIFIED AS BUILT" THIS PLAN HAS BEEN REVISED AND SHOWS SYSTEMS / ELECTRICAL EQUIPMENT AS THEY HAVE BEEN INSTALLED (Signature of Contractor) (Date). |
| 3.13 RESPONSIBILITIES DURING TEMPORARY TRIAL TESTING | .1 | Protect the work against loss or damage until its acceptance. |
| | .2 | During the temporary use, the warranty period will not be affected. |
| | .3 | The owner can use the facilities and equipment for testing before they have accepted. Provide labor, materials and necessary instruments for testing. |
| | .4 | Facility and equipment should be cleaned, refurbished and in good working condition before their acceptance and isolate equipment that could be damaged. |
| | .5 | Prevent dust, dirt and other foreign matter from entering openings of facilities and equipment for temporary use. |
| 3.14 RECEPTION OF WORK DISCIPLINARY "ELECTRICITY" | .1 | This procedure of acceptance of work does not prevent the taking possession of the building by the owner and if the occupation is conducted prior to approval of work, the systems must be put in operation and kept in service until at the time of receipt of the work. |
| | .2 | Acceptance of the work will be required by the general contractor when the work under will be fully completed. The general contractor will make a joint written request with its subcontractor identifying the work of the subcontractor of the discipline "Electricity" are fully completed and ready for the reception. In the event that certain works |

are not completed, they must be clearly identified by the Contractor's request and justification to be appended.

The department's representative will then determine whether the acceptance of work. Upon receipt of the request of the Contractor General, the department's representative will, on schedule with the general conditions, a site visit and prepare a list of deficiencies. If it happened that there remains work to be completed or that the list of deficiencies is too great to justify the reception of the work (more than 0.5% of the value of work covered), the Contractor shall complete and / or correct its work before a list of deficiencies is issued.

.3 Whichever occurs first, either under clause turnaround or from the date the Contractor General has asked the reception of the work and confirmed that these are completed, it will reimburse the owner of all fees and additional costs it must pay to the department's representative in relation to extended services including surveillance, without limitation, all costs incurred for monitoring (in the office and on site) and travel expenses, subsistence and accommodation, for all additional visits to the scheduled visit to make a list of deficiencies and to that provided to ensure that all deficiencies have been corrected. The pace of site visits will be maintained as during the execution of works if the original schedule is exceeded.

.4 The visit to check if all deficiencies are corrected will be done one month after issuing the list of deficiencies, in order to allow a reasonable time to correct deficiencies.

3.15 ELECTRICAL EQUIPMENT SUPPORT

.1 In the general purpose areas, all electrical devices (switch, gutter, distribution panel, starter, box measuring, etc.) Must be installed on a plywood 19 mm thick, fireproof, painted gray, or media profiles. Use a fireproof paint.

.2 In fire resistant areas, use metal supports such as galvanized steel profiles for mounting electrical appliances.

.3 All wall-mounted plates are to be supplied and installed by general contractor.

3.16 EXCAVATION, FILLING AND CONCRETE

.1 Ensure that the excavation for electrical services is buried along the outline and depth indicated. Install protective materials around and over electrical services at the scene, and at all times during excavation and backfill.

.2 The work must comply with Section 12 of the Quebec Construction Code, Chapter V, Electricity.

.3 The excavation, backfilling are under the responsibility from other disciplines.

3.17 EXTENDED FUTURE PLANS .1

In any place where a space was left free for future use, the Contractor shall see that this space is free, but must also install conduit and

other equipment relating to its work so that future connections of equipment can be added without having to redo some of the facilities of electricity.

3.18 ACCESS DOORS

- .1 The Contractor shall provide access panels as they are manufactured by a recognized manufacturer either located on floors, walls or ceilings. Each device is identified and its function will be described on a framed picture.
- .2 These accesses, wall and ceiling, will be made of steel with a base paint finishing and with doors and frames. The hatch can be mounted with concealed hinges and lock and key and barrel mark ILCO 575 (a common key for all hatches for electricity). These traps will be 30 cm x 30 cm or more as minimum access to reach.
- .3 These access panels will be installed by the general contractor at the places indicated by the contractor of this field.
- .4 In places where suspended ceilings are provided in removable tiles, these will then be used as access hatches.
- .5 Access panels that are installed in walls and ceilings will have the same fire resistance as the wall or ceiling where they are installed.
- .6 Access panels must comply with the Building Code of Quebec, Chapter 1, Building and NBC, latest edition.

3.19 UNIFORMITY AND CONSISTENCY

- .1 The Contractor shall comply perfect uniformity between the different systems for each specialty.
- .2 The department's representative may at any time, prior to installation, if deemed necessary, move within 3 m any equipment such as equipment of ancillary services, fans, lights, switches, sockets, breakers circuits, transformers, lighting, etc.. at no additional cost. It is incumbent upon the contractor to coordinate with other trades and contractors representative and get the necessary approvals from the departments.
- .3 No light fixture shall be placed above the pipes, ducts or other obstructions.
- .4 All fittings used as pull boxes and junction boxes must be selected according to the requirements of the Building Code of Québec, chapter V, latest edition taking into account the number and the conductor and conduit involved.
- .5 Pull boxes and junction boxes must be located in protected areas and easily accessible.
- .6 Contractors should note that the plans provided to him as a guide and are sometimes on a smaller scale and do not always have Dimension. He must use his judgment and ensure that the accessories of these systems integrate well with the structure and architecture of the building.

.7 For the same specialty or same trade, the equipment of the same type (eg, fluorescent fixtures, incandescent, starters, etc.) must come from a single manufacturer.

3.20 GLASS PARTITIONS .1 Be careful not get any vertical path of ducts where a glass partition is shown on architectural drawings. Where applicable, ducts or wiring BX will be located in the mullions.

END OF SECTION

PART 1 - GENERAL

- .1 Generally, the plans and specifications are intended to describe the work required such as the establishment, installation, testing, material requirements, etc. to ensure full implementation of the work. Run all in accordance with standards, laws and regulations
- .2 The contractor is responsible for the proper execution of all work described in plans and specifications.
- .3 The general contractor is responsible to supply temporary services for electricity and telephone services for himself and the sub-contractors during the time of construction.
- .4 The contractor is responsible to ensure adequate coordination with subcontractors.
- .5 The equipment and specified materials establish minimum requirements of quality and performance.
- .6 Not limited to, the work is summarized in section 26 05 05.

**1.1 RELATIONS BETWEEN
ARCHITECTURAL,
STRUCTURAL,
MECHANICAL AND
ELECTRICAL DOCUMENTS**

- .1 Plans, specifications and addenda of architectural, structural, mechanical or electricity complement each other and must be consulted and studied together to be aware of how this may affect the particular work of each trade. No additional amount will be paid to the contractor for not foreseeing the cost of all the work, travel and other similar work, etc. which are necessitated by the structure of the building or equipment, pipes and conduits, accessories or other items or work required.

**1.2 ORGANISATION OF THE
SPECIFICATIONS**

- .1 This document covers the description and installation of all equipment which are generally used for making all types of electrical work.
- .2 The scope of work relating to these works is outlined in the plans and section 26 05 05 of the specifications.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

- .1 This section covers electrical works to perform.
- .2 Contractor to provide necessary labor, equipments, cables, electrical conductors and ducts, documentation, devices, machinery, scaffolding supports, services, testing equipments, materials and all related components for building, delivery, installation, connection, testing, commissioning and warranty of equipments and materials for all works described in this section.
- .3 Conductors for each power supply of required caliber and disconnection for a steady state voltage drop under 3% between its corresponding transformer and all equipments powered by said transformer.
- .4 Contractor to perform works in accordance with any and all contractual requirements and must examine worksite and gather all details pertaining to existing conditions and limitations. Contractor to know of problems that may arise during works; in no case will any claims be accepted if conditions are not respected due to negligence.
- .5 Contractor to verify all plans of every discipline of current project to fully know every connections of which contractor is responsible. Should any electrical equipment become faulty after bad connections, electrical contractor will be held responsible along with contractor who provided said equipment.
- .6 Contractor to start all connected equipments in presence of contractor who provided said equipments, to prevent defects or failures.

1.2 SCOPE OF WORK

- .1 Works as described hereunder are not exhaustive. Works are described more specifically in documents, plans and drawings. All components or accessories necessary for a full and complete installation must be provided and installed, even if not specifically described to on documents.
 - .1 Provide, install and connect all necessary equipment to perform the following works:
 - Dismantling of existing facilities (pumping well)
 - Fuse switch
 - Cable and conduit buried
 - 120/240V distribution panel
 - 600-120/240V transformer
 - Outlet
 - Indoor and Outdoor Lighting

- Ventilation control
- Heating
- Connection of special charges (mechanical)
- Grounding

- 1.3 GENERAL CONTRACTOR .1 General contractor is responsible for providing materials and completing the following works:
- .1 Installation of required concrete for electrical equipment bases;
 - .2 Excavation, backfilling, compaction and concreting;
 - .3 Concrete molds.
- 1.4 SHOP DRAWINGS FOR SUBMITTAL .1 List of shop drawings to submit included as appendice to section 01 33 00 – Submittals.

PART 2 - PRODUCTS

- 2.1 LIST OF MATERIALS TO SUBMIT TO OWNER .1 N/A

PART 3 - EXECUTION

- 3.1 NEUTRAL CONDUCTOR .1 Connect neutral conductors to common neutral omnibus bar. Identify each neutral conductor appropriately.
- .2 Fit every 120ACV circuit with own neutral conductor. Do not use a common neutral conductor for multiple circuits. Branches may be fitted with common neutral in accordance with Code de Construction du Québec.
- 3.2 CIRCUIT BREAKERS RUPTURE CAPACITY .1 Rupture capacity of circuit breakers to meet the following:
- A) To full nominal value.
 - B) To nominal value of integrated protection of equipments with upstream protection device (serial protection). Should manufacturer go with second choice, manufacturer to provide laboratory tests certifying proper operation of system and indicate, on equipment using a name plate, test voltages, upstream protection device, admissible branching devices, panel designation and voltages.
- .2 No integrated protection (serial) accepted for loads over 400 A.

- .3 No integrated protection (serial) accepted for emergency network.
- .4 No integrated protection (serial) accepted if total of motors nominal voltage serially connected is above 1% of downstream breaker nominal breaking capacity.
- .5 All documentation to be provided with shop drawings (at same time). Any delays in submitting documentation will delay shop drawing review.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Wire and Box connectors, materials, related materials and their installations
- 1.2 REFERENCES .1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- .2 CSA C22.2 No.65-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).
- .3 National Electrical Manufacturers Association (NEMA)
- 1.3 WASTE MANAGEMENT AND DISPOSAL .1 Separate and recycle waste materials in accordance with Section [01 74 21 - Construction/Demolition Waste Management And Disposal].
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by the department's Representative.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Pressure type wire connectors to: 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 NEMA to consist of:
- .1 Connector body and stud clamp for copper
- .2 Clamp for stranded copper conductors.
- .3 Clamp for stranded aluminum ACSR conductors
- .4 Stud clamp bolts.

- .5 Bolts for copper conductor or bar.
- .6 Bolts for aluminum conductor bar.
- .7 Sized for conductors and bars as indicated.
- .4 Clamps or connectors for armored cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required
- .5 Watertight approved for TECK Cable
- .6 All connectors and clamps are to be "Thomas & Betts" or "Burndy."

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install the connectors as per manufacturer's recommendations for bar connection.
- .2 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws [with appropriate compression tool recommended by manufacturer]. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2, NEMA.
 - .5 Contractor must prove that each screw has been tightened as per manufacturer's recommendation.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 This section applies to copper conductors, ACM Alloy conductors and aluminum conductors designed for nominal voltages from 0 to 1000 volts, and the ducts and most common electrical insulators.
- 1.2 REFERENCES .1 Québec Construction Code, Chapter V, Electrical.
.2 CSA C22.2 no 0.3, Testing methods for Electrical Cables and Wires.
- 1.3 PRODUCT DATA .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures et 26 05 00 – Electrical General Requirements.
.2 Perform electrical test methods in accordance with section 26 05 00 – Electrical General Requirements.
- 1.4 DELIVERY, STORAGE AND HANDLING .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

- 2.1 BUILDING WIRES .1 Where cables assemblies are specified to have a PVC overall covering it may be required to comply to the Vertical Tray Fire Test of CSA C22.2 No.0.3 for the applicable Building Code classification of the project as it relates to the actual installed location.
.2 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
.3 Copper conductors: size as indicated, with 600 or 1000V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE or RWU90 XLPE.
.4 Use insulated wiring of 1000 V for motors controlled by variable frequency.
.5 An insulated GREEN conductor of minimum size 12 AWG is required.
.6 Neutral supported cable: 1, 2, 3 phase insulated conductors of Copper or Aluminum and one neutral conductor of Copper or Aluminum steel reinforced, size as indicated. Type: NS75 or NS90 Insulation: Type NS-1 rated 300 V and Type NSF-2 flame retardant rated 600 V.
- 2.2 TECK 90 CABLE NS-1, for rate voltage of 300 V and NSF-2, Fireproof for rate voltage of 600 V.

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .1 Grounding conductor: copper.
- .2 Circuit conductors: copper size as indicated.
- .3 Insulation: Cross-linked polyethylene XLPE. Rating: 600 V. Inner jacket: polyvinyl chloride material. Armor: galvanized steel.
- .4 Teck Cables used for control and communication not exceeding 300 V should be isolated at 600 V and should be of metal armor with galvanized steel tape. The conductors should be copper 12 gauge minimum or a gauge superior considering charges and voltage drop and the number of conductors per cable.
- .5 All Teck Cables will be of type 90 with exterior PVC sheathing. Comply with CAN/CSA-C22.2 no 131 and 174 for hazardous locations (HL) and Fire retardant (FT-4).
- .6 Teck Cables, when installed in cable trays, must meet the Québec Standards Building Code, Chapter V – *Electricity section 4* and 12, as well as adjustment factors relevant to tables 5A and 5D.
- .7 Overall covering: thermoplastic polyvinyl chloride, [compliant to applicable Building Code classification for this project].
- .8 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 1.5 mm centers.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .9 Connectors:
 - .1 Watertight, explosion-proof approved for TECK cable.

2.3 ARMoured CABLES

- .1 Conductors: insulated, copper size as indicated.
- .2 Type: AC90
- .3 Armor: interlocking type fabricated from galvanized steel aluminum strip.
- .4 Type: ACWU90, PVC, flame retardant jacket over armor and compliant to applicable Québec Building Code classification for this project - wet locations.
- .5 Connectors: anti short connectors.

- 2.4 CONDUCTORS EXPOSED TO SUNLIGHT .1 Insulated wires and power cables directly exposed to sunlight have to be protected specifically approved for such use and be labeled accordingly.

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 tests using method appropriate to site conditions and to approval of the department's Representative 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 Color 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 centers, 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.
- .6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.
- .7 Drop cables in trenches in accordance with section 33 71 73.02 – Underground electrical service.
- .8 Drop cables in cable trays in accordance with section 26 05 36 – Cable Trays for Electrical Systems
- .9 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- 3.3 INSTALLATION OF BUILDING WIRES .1 Unless otherwise stated, all wiring must be under conduit.
- .2 Use the types of conduits or pipe in accordance to the requirements of the respective section.

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

- .1 Install cable as indicated securely supported by staples, straps or hangers.
- .2 when there are 2 cables in the same course, bind them in a «U».
- .3 When there are two cables on the same path in the building, Teck cables must be installed in cable shelves.
- .4 Cable terminations in accordance with section 26 05 20 - Wire and Box Connectors 0 - 1000V.

3.5 INSTALLATION OF
ARMOURED CABLES

- .1 In ceilings and drywall, the contractor may use armored cables AC-90 between light fixtures so that the length between fixtures and junction boxes do not exceed 3000mm.
- .2 In the ceilings and drywall, the contractor may use armored cables AC-90 between plugs on the same circuit so that the length of cable used between two plugs or between two junction boxes does not exceed 6000mm.
- .3 A maximum of groups of 3 cables wherever possible. Support at each 1.5 meters. Cables should follow structural lines of the building. No horizontal cables in the wall will be accepted.
- .5 Use of armored cable AC-90, apparent on the surface is prohibited.
- .6 Terminate cables in accordance with section 26 05 20- Wire and Box Connectors 0-1000V.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian Standards Association, (CSA International)
 - .2 Grounding equipment based on CSA C22.2 No. 41.
 - .3 CAN/CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities.
- 1.2 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .4 Divert unused metal materials from landfill to metal recycling facility as approved by the department's Representative.
 - .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

- 2.1 EQUIPMENT
- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
 - .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.
 - .3 Rod electrodes: copper clad steel 19 mm diameter by 3 m long.
 - .4 Plate electrodes: copper, surface area 0.2 m², 1.6 mm thick.
 - .5 Grounding conductors: bare stranded copper, tinned, soft annealed size as indicated.
 - .6 Insulated grounding conductors: green, type RWU-90 when ground or surroundings are humid and type RW-90 in other areas, size as indicated.
 - .7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
 - .8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.

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| | .2 | Protective type clamps. |
| | .3 | Bolted type conductor connectors. |
| | .4 | Thermite welded type conductor connectors. |
| | .5 | Bonding jumpers, straps. |
| | .6 | Pressure wire connectors. |
| | .7 | Compression connectors |
| | .9 | Junction box (access) brand name «SYNERTECH» or approved equivalent. |
| 2.2 | <u>MANUFACTURER</u> | .1 Accepted Manufacturers: Thomas & Betts for mechanical joints and Cadwell or Thermoweld for welded joints by aluminothermy or Burndy |

PART 3 - EXECUTION

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| 3.1 | <u>INSTALLATION GENERAL</u> | .1 Install complete permanent, continuous grounding system including, electrodes (minimum 3 per site), conductors, connectors, as indicated, to satisfy the requirements of the representative of CDC and local authorities. |
| | | .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, electrodes, using copper welding by thermite process. |
| | | .5 Use mechanical connectors for grounding connections to equipment provided with lugs. |
| | | .6 Soldered joints not permitted unless they complete the installation of a compression joint. |
| | | .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solder less 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 Install separate ground conductor to outdoor lighting standards. |
| | | .10 Install grounding resistance bank. |
| | | .11 Install zigzag grounding transformer [on line side of main interrupter]. |
| | | .12 Make grounding connections in radial configuration only, with |

- connections terminating at street side of water pipe. Avoid loop connections.
- .13 Bond single conductor, metallic armored cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .14 Ground secondary service pedestals.
- 3.2 MANHOLES
- .1 Install conveniently located grounding stud, electrode, stranded copper conductor in each manhole.
- .2 Install ground rod in each manhole so that top projects through bottom of manhole. Provide with lug to which grounding connection can be made.
- 3.3 ELECTRODES
- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Make the connection for continuity of mass with at minimum a 6 AWG conductor at the nearest point of entry from the connection of all metallic network of water when it is not used as a ground.
- .4 Also ensure that continuity of all gas distributing metal piping under pressure and make connection to conductors of the main ground.
- .5 Install electrode embedded in concrete footings of the foundation of the building, and connect the terminals to the grounding network.
- .6 Install the electrode plates or rods and make connections to ground as indicated. Coordinate with the general contractor of the rock drilling rods for installation.
- .7 Bond separate, multiple electrodes together.
- .8 Use copper conductors for connections to electrodes, size as indicated.
- .9 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevail as per Quebec Construction Code. Make connections as indicated.
- .10 Install a junction box (access) bottomless fiber on each rod in order to simplify the location in the soil. The box must not exceed 150 mm, finished grade.
- 3.4 SYSTEM AND CIRCUIT GROUNDING
- .1 Install system and circuit grounding connections to neutral of primary 347/600 V system, secondary 120/208 V, 120/240 V system.

- 3.5 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 centers, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.
- 3.6 GROUNDING BUS .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections, size as indicated.
- 3.7 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 or manufacturer.
- .2 Sound System and Intercom: ground all lines and cable tray under the guidance and direction of manufacturer.
- .3 Sound, fire alarm, intercommunication systems as indicated by manufacturer.
- 3.8 FIELD QUALITY CONTROL .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the department's Representative and local authority having jurisdiction over installation. Give a copy of the results to the representative of CDC. Tests should be performed by a specialized firm and signed by an engineer.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 This Section specifies U shape support channels either surface mounted, suspended or set in poured concrete walls and ceilings
- 1.2 WASTE MANAGEMENT AND DISPOSAL .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by the department's Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

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.
- .2 Installation accessories such as threaded rods, bolts, washers, nuts, spring nuts, etc., or steel plated, chrome or zinc.
- .3 Galvanized products according to CAN/CSA-G164 standards.
- .4 Fasteners used outdoors or in wet areas must be stainless steel.
- .5 Fasteners, brackets and installation accessories must conform to the requirements of section 26 10 00 – Seismic Mountings.

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Refer to Section 01 61 00 - Common Product Requirements for fastenings and supports.
- .2 Secure equipment to hollow, solid, masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .3 Secure equipment to poured concrete with expandable inserts.
- .4 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

- .5 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.
- .6 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .7 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.
- .8 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.
- .9 For surface mounting of two or more conduits use channels at 1 m on centre spacing.
- .10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the department's Representative.
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .15 Coat with galvanized parts all surfaces that are scratched, altered or cut.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-[06], Canadian Electrical Code, Part 1, current edition.
- .2 Splitters are referenced to comply with CSA C22.2 No. 76.
- .3 Junction and pull boxes are referenced to comply with CSA C22.2 No. 40.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and 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.
- .3 Provide shop drawings: in accordance with Section 26 05 00 - Common Work Results For Electrical.
- 1.3 DELIVERY, STORAGE AND HANDLING .1 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/ Demolition Waste Management and Disposal.
- 1.4 ELECTRICAL EQUIPMENT PROTECTED BY SPRINKLERS .1 Supply and install the equipment in accordance with section 26 05 00 - Common Work Results For Electrical.

PART 2 - PRODUCTS

- 2.1 SPLITTERS .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs, connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

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| 2.2 | <u>JUNCTION AND
PULL BOXES</u> | .1 | Construction: welded steel enclosure. |
| | | .2 | Covers Flush Mounted: 25 mm minimum extension all around. |
| | | .3 | Covers Surface Mounted: 150 x 150, must be fitted with hinges. |
| 2.3 | <u>CABINETS</u> | .1 | Type E Empty: Sheet steel enclosure for surface mounting with sides and folded edges overlapping fitted with hinged door, handle, lock and a latch. |
| | | .2 | Type T Terminal: surface return flange, flush overlapping sides mounting as indicated containing 19 mm thick, sheet steel backboard. |
| | | .3 | Construction: welded [sheet steel] [aluminum] [as indicated] hinged door, [handle], [latch] [lock 2 keys] and catch |
| 2.4 | <u>CONNECTIONS</u> | .1 | Insulated metal bushings and connectors with nylon insulated groove, size no. 8 AWG or more. |
| | | .2 | Pressure pads to prevent debris to penetrate the outlets. |
| | | .3 | Access fittings for pipes up to 35 mm in diameter and pull boxes for larger conduits. |
| | | .4 | Locking nuts and insulated metal bushings on sheet metal box. |

PART 3 - EXECUTION

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| 3.1 | <u>SPLITTER INSTALLATION</u> | .1 | Mount plumb, true and square to building lines. |
| | | .2 | Extend splitters full length of equipment arrangement except where indicated otherwise. |
| 3.2 | <u>JUNCTION, PULL
BOXES AND CABINETS
INSTALLATION</u> | .1 | Install pull boxes in inconspicuous but accessible locations. |
| | | .2 | Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise. |
| | | .3 | Install terminal block as indicated in Type T cabinets. |
| | | .4 | Only main junction and pull boxes are indicated. Install additional pull boxes so as not to exceed 30 m of conduit run between pull boxes or 4-90 degree elbows. |
| | | .5 | supply thermal blocks in the junction boxes containing more than 4 joints. |
| 3.3 | <u>IDENTIFICATION</u> | .1 | Equipment Identification: to Section 26 05 00- Common Work Results for Electrical. |

- .2 Identification Labels: size 2 indicating system name voltage and phase or as indicated.

END OF SECTION

PART 1 - GENERAL

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| 1.1 | <u>REFERENCES</u> | .1 | Canadian Standards Association (CSA International) |
| | | .1 | CSA C22.1, Canadian Electrical Code, Part 1, 20th Edition. |
| | | .2 | Outlet boxes, conduit boxes and fittings are based on CSA C22.2 No. 18. |
| 1.2 | <u>ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 26 05 00 – Common work results for electrical |
| | | .2 | Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures and Section 26 05 00 – Common work result for electrical. |
| 1.3 | <u>DELIVERY, STORAGE AND HANDLING</u> | .1 | Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements. |
| | | .2 | Waste Management and Disposal: |
| | | .1 | Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal. |

PART 2 - PRODUCTS

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| 2.1 | <u>OUTLET AND CONDUIT BOXES GENERAL</u> | .1 | Size boxes in accordance with the Quebec construction code, chapter V, Electrical. |
| | | .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 | <u>GALVANIZED STEEL OUTLET BOXES</u> | .1 | One-piece electro-galvanized construction. 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	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 extension and plaster rings for flush mounting devices in finished plaster or tile walls.
2.3	<u>MASONRY BOXES</u>	.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.
2.4	<u>CONCRETE BOXES</u>	.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.
2.5	<u>FLOOR BOXES</u>	.1 Concrete tight electro-galvanized sheet steel floor boxes 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: 73 mm for receptacles and communication outlets.
	.2	Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for [16, 21 and 27] mm conduit. Minimum size: 73 mm deep.
2.6	<u>CONDUIT BOXES</u>	.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.
2.7	<u>OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE</u>	.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.
2.8	<u>FITTINGS - GENERAL</u>	.1 Bushing and connectors with nylon insulated throats for n° 8 AWG caliber and up.
	.2	Knock-out fillers to prevent entry of debris.
	.3	Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
	.4	Double locknuts and insulated bushings on sheet metal boxes.
2.9	<u>SERVICE FITTINGS</u>	.1 'High tension' receptacle fitting made of 2 piece stainless steel or die-cast aluminum with brushed aluminum or satin aluminum housing finish for 1 single, 1 duplex or two duplex receptacles. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.
	.2	Pedestal type 'low tension' fitting made of 2 piece stainless steel or die cast aluminum with brushed aluminum or satin aluminum housing finish to accommodate one or two Amphenol jack

connectors.

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 armored 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

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| 1.1 | <u>SECTION CONTENTS</u> | | This section specifies rigid and flexible fasteners, fittings and installation. |
| 1.2 | <u>DUCTS
LOCATION</u> | .1 | All ducts are not shown on the drawings. Those who are represented are on a schematic form. |
| 1.3 | <u>SEISMIC
FASTENERS</u> | .1 | Supply and install all necessary equipment for seismic mountings as indicated in Section 26 10 00 – Seismic Fasteners. |
| 1.4 | <u>ELECTRICAL
APPARATUS
PROTECTED BY
SPRAY NOZZLES</u> | .1 | Provide and install material in accordance with Section 26 05 00 – General Requirements. |
| 1.5 | <u>REFERENCES</u> | .1 | Canadian Standards Association (CSA International). |
| | | .1 | CAN/CSA-C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, a National Standard of Canada. |
| | | .2 | CSA C22.2 No. 45, Rigid Metal Conduit. |
| | | .3 | CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit. |
| | | .4 | CSA C22.2 No. 83, Electrical Metallic Tubing. |
| | | .5 | CSA C22.2 No. 211.2, Rigid PVC Unplasticized Conduit. |
| | | .6 | CAN/CSA-C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada. |
| | | .2 | Construction Code of Quebec, Chapter V, Electrical. |
| 1.6 | <u>ACTION AND
INFORMATIONAL
SUBMITTALS</u> | .1 | Submit required samples and documents in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – General Requirements. |
| | | .2 | Product data: submit manufacturer's printed product literature, specifications and datasheets. |
| 1.7 | <u>WASTE MANAGEMENT AND
DISPOSAL</u> | .1 | Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – 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.

PART 2 – PRODUCTS

2.1 CONDUITS

- .1 Rigid metallic conduits: in accordance with standard CSA C22.2 no 45, threaded galvanized steel.
- .2 Epoxy coated conduits: in accordance with standard CSA C22.2 no 45, with zinc coating and anti-corrosive finishing coat with an epoxy based resin, inside and outside.
- .3 Electrical metallic tubing (EMT): in accordance with standard CSA C22.2 no 83, equipped with “Raintight” connectors.
- .4 Rigid PVC conduits: in accordance with standard CSA C22.2 no 211.2.
- .5 Flexible metal conduit: to CSA C22.2 no 56, liquid-tight flexible metal.
- .6 FRE conduit: CSA C22.2
- .7 Flexible PVC conduit: to CAN/CSA-C22.2 no 227.3.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50mm and smaller.
- Two hole steel straps for conduits larger than 50mm.
- Use stainless steel fasteners when installed outside or in damp locations.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 2m on centre.
- .4 Threaded rods, 6mm diameter, to support suspended channels.
- .5 Quantities and dimensions mentioned above for various fasteners are a minimum and must meet the requirements of the section on seismic fasteners.

2.3 CONDUIT FITTINGS – GENERAL

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

	.4	Ferrules for fittings in boxes, when required, to Construction Code of Quebec, Chapter V - Electricity, metal type and nylon isolated.
2.4 <u>EXPANSION FITTINGS</u>	.1	Provide expansion fittings required for all conduits: <ul style="list-style-type: none"> - embedded in concrete and crossing expansion joints through the building; - apparent and undergoing significant changes in temperature; - exceeds the limit allowed by the manufacturers.
	.2	Weatherproof expansion fittings with internal bonding assembly suitable for 200mm linear expansion.
	.3	Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19mm deflection.
	.4	Weatherproof expansion fittings for linear expansion at entry of panel.
2.5 <u>FISH CORD</u>	.1	Polypropylene 6mm.
2.6 <u>BONDING</u>	.1	IN all conduits other than those mentioned in 2.1.1, a green insulated conductor with a minimum calibre of 12 AWG must be installed.
2.7 <u>CONDUITS EXPOSED TO SUN LIGHT</u>	.1	Non-metallic pipes that are entirely exposed to sunlight have to be specifically approved for this usage and be marked in accordance.
PART 3 – EXECUTION		
3.1 <u>MANUFACTURER'S INSTRUCTIONS</u>	.1	Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
3.2 <u>INSTALLATION</u>	.1	Install the visible conduits so as to diminish the part's head-way and by using the least amount of space possible.
	.2	Conceal conduits except those which are installed in mechanical and electrical facility rooms.
	.3	Use electrical metallic tubes (EMT) with tight connectors in technical rooms, warehouses, service garages etc. and standard fittings for ordinary locations.
	.4	Use rigid PVC conduits in underground facilities.
	.5	Use rigid threaded galvanized steel conduit in places classified explosion proof, in tunnels and wetlands.

- .6 Use epoxy coated conduit in corrosive or saline installations.
- .7 Use over a maximum length of 3m flexible metallic conduits when connecting to motors, transformers and equipment capable of vibration located in dry areas, incandescent bulbs, built-in and without pre-threaded outlet box, mounted fluorescent light fixture connection, projecting or built-in, works or elements in movable metal partitions.
- .8 Use flexible metal conduit and liquid-tight connections when connecting to motors and / or equipment which may vibrate or transformers located in damp or wet or corrosive environments.
- .9 Use explosion proof flexible connections for connection to explosion proof motors.
- .10 Install waterproof connections on conduits installed in dangerous locations. Fill them with sealing compound.
- .11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .12 Mechanically bend steel conduit over 21mm diameter.
- .13 Use conduits of at least 21 mm for lighting and power circuits.
- .14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .15 Install fish cord in empty conduits.
- .16 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .17 Dry conduits out before installing wire.
- .18 For every flush-mounted panel, install three Ø 27 mm conduits from panel into ceiling space and three Ø 27 mm conduits from panel into the lower floor ceiling space (if applicable) . If no ceiling was provided for in these parts, install conduits as high as possible between the floor and the structure or provide an access door 300 x 600 mm to 300 mm above the panel.

3.3 VISIBLE CONDUITS

- .1 Unless indicated otherwise, installs the conduits parallel or perpendicular to the building's layout lines.
- .2 Behind infrared or gas radiators, install conduits by leaving a space of 1.5m.
- .3 Make the conduits pass through the wings of the steel framework elements, if needed.
- .4 In locations where this is not possible, group the conduits into U-bend stirrups.
- .5 Unless otherwise specified, the conduits should not cross through framework elements.

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| | .6 | In the case of conduits placed parallel to steam or hot water pipes, make provisions for a lateral space of at least 75mm; also make provisions for a space of at least 25mm in the case of crossings. |
| | .7 | Install PVC expansion joints on conduit when installed in places where the temperature varies from 10 degrees and more. It must have an expansion joint for each length of 7.5m and 15m between each joint. |
| 3.4 | <u>CONCEALED CONDUITS</u> | |
| | .1 | Install conduits parallel or perpendicular to the building's layout lines. |
| | .2 | It is forbidden to install horizontal conduits in masonry walls. |
| | .3 | It is forbidden to embed the conduits into terrazzo works and concrete toppings. |
| | .4 | No horizontal conduits will be accepted in drywall. Only vertical conduits will be tolerated. |
| 3.5 | <u>CONDUITS IN CAST-IN-PLACE CONCRETE</u> | |
| | .1 | Do not install conduits in concrete structures unless otherwise specified in the shop drawings and specifications. |
| | .2 | Locate to suit reinforcing steel. Install in centre one third of slab. |
| | .3 | Protect conduits at their exit points from a concrete work. |
| | .4 | Install sleeves where conduits pass through slab or wall. |
| | .5 | Before covering a concrete work with a water repellent membrane, install oversized joints in the locations where conduits have to pass through the latter. Apply a cold compound between the joints and conduits. |
| | .6 | Conduits in slabs: minimum slab thickness 4 times conduit diameter. |
| | .7 | Encase conduits completely in concrete with minimum 25mm concrete cover. |
| | .8 | Organize conduits in slab to minimize cross-overs. |
| | .9 | Aluminum conduits shall not be concealed in concrete structures. |
| 3.6 | <u>CONDUITS UNDERGROUND</u> | |
| | .1 | Slope conduits to provide drainage. |
| | .2 | Waterproof the joints using a thick layer of bituminous paint. |
| | .3 | Install conduit at 1m from the surface or as directed. |
| | .4 | The underground conduits shall be of rigid PVC 41mm minimum. |
| | .5 | The underground conduits must be surrounded by a 150mm layer of fine sand unless otherwise stated. |

3.7 FIREWALL CROSSING
CONDUITS

.1

Caulk all gaps between the firewall and the conduit. Fire resistance shall be equal to surface crossing. The product manufacturer shall make an inspection of the work and issue a certificate stating that the facilities are inspected and comply with its recommendations and meet the requirements of ULC fire resistance characteristics.

END OF SECTION

PART 1 - GENERAL

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| 1.1 | <u>DESCRIPTION</u> | .1 | This Section specifies the installation of direct buried cables and cables in ducts including protection, markers and testing. |
| 1.2 | <u>REFERENCES</u> | .1 | Canadian Standards Association, (CSA International) |
| | | .2 | Insulated Cable Engineers Association, Inc. (ICEA) |
| 1.3 | <u>WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. |
| | | .2 | Remove from site and dispose of all packaging materials at appropriate recycling facilities. |
| | | .3 | Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | | .4 | Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard. |
| | | .5 | Divert unused metal and wiring materials from landfill to metal recycling facility as approved by a the department's Representative. |
| | | .6 | Do not dispose of preservative treated wood through incineration. |
| | | .7 | Do not dispose of preservative treated wood with other materials destined for recycling or reuse. |
| | | .8 | Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by a department's Representative. |
| | | .9 | Fold up metal banding, flatten and place in designated area for recycling. |

PART 2 - PRODUCTS

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| 2.1 | <u>CABLE PROTECTION</u> | .1 | 38 x 140 mm planks pressure treated with clear copper napthenate or 5% pentachlorophenol solution, water repellent preservative. |
| | | .2 | Plastic caution and identification tape marked Danger Electricity. |
| 2.2 | <u>MARKERS</u> | .1 | Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs. |
| | | .2 | Cedar post type markers: 89 x 89] mm, 1.5 m long, pressure |

treated with clear copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing cable or conduit to indicate depth and direction of duct and cable runs.

- .1 Nameplate: aluminum anodized 89 x 125 mm, 1.5 mm thick mounted on cedar post with Mylar label 0.125 mm thick with words Cable, Joint or Conduit with arrows to indicate change in direction.

PART 3 - EXECUTION

3.1 DIRECT BURIAL OF CABLES

- .1 After sand bed specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Underground cable splices not acceptable.
- .4 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armored cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .5 Cable separation:
 - .1 Maintain 75 mm minimum separation between cables of different circuits.
 - .2 Maintain 300 mm horizontal separation between low and high voltage cables.
 - .3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
 - .4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.
 - .5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.
 - .6 Install treated planks on lower cables 0.6 m in each direction at crossings.

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| | .6 | After sand protective cover specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, install caution tape as indicated to cover length of run. |
| 3.2 CABLE INSTALLATION
<u>IN DUCTS</u> | .1 | Install cables as indicated in ducts. |
| | .2 | Do not pull spliced cables inside ducts. |
| | .3 | Install multiple cables in duct simultaneously. |
| | .4 | Use ACNOR approved lubricants of type compatible with cable jacket to reduce pulling tension. |
| | .5 | To facilitate matching of color coded multiconductor control cables reel off in same direction during installation. |
| | .6 | Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape. |
| | .7 | After installation of cables, seal duct ends with duct sealing compound. |
| 3.3 <u>MARKERS</u> | .1 | Mark cable every 150 m along cable duct runs and changes in direction. |
| | .2 | Where markers are removed to permit installation of additional cables, reinstall existing markers. |
| | .3 | Install concrete cable markers within 180 m from each side of runway centerline; 45 m from each side of taxi way centerline; 50 m from edge of taxi ramps or aprons. |
| | .4 | Install cedar post type markers. |
| | .5 | Lay concrete markers flat and centered over cable with top flush with finish grade. |
| 3.4 CABLE INSTALLATION
<u>IN CABLE TROUGH</u> | .1 | Install cables separately in cable trough or as indicated. |
| | .2 | Splices are not acceptable in cable trough unless indicated otherwise. If spliced, joints and fittings must isolated and accessible in cable trough. |
| | .3 | Cables must be installed in cable trough as much as possible. |
| | .4 | Use proper pulley to fish cables. |
| | .5 | Radii of cables must not be less than three times the diameter of cables or as directed by manufacturer. Radii of pulleys and cables must me these requirements. |
| | .6 | When fishing cables, use socks simultaneously around both ducts |

and eyelets fixed to conductors.

- .7 Identify cables after installment as indicated in Section 26 05 00 – Common Work Results - Electrical.
- .8 Fasten the cables with nylon ties every 6 meters in the horizontal cable trays.
- .9 Fasten cables with the appropriate metal fasteners for cables / cable trays, every 1.5 meters in the vertical cable trays.
- .10 Install metal separators between different voltage cables.
- .11 Protect cables with appropriate cover over cable trays in areas subject to mechanical damage and as indicated.

3.5 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 For three-phase circuits, verify and establish a phase sequence A-B-C from left to right, from top to bottom and front to back and keep it for the entire system with the exception of the equipment installed in reverse and electrically connected.
- .4 Check phase rotation and identify each phase conductor of each feeder.
- .5 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .6 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .7 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armor and conductors not under test.
 - .3 High Potential (Hipot) Testing.

- .1 Conduct hipot testing at original factory test voltage in accordance with manufacturer's recommendations.
- .4 Leakage Current Testing.
 - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by manufacturer.
 - .3 Record leakage current at each step.
- .8 Provide the department's Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .9 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

PART 1 – GENERAL

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| 1.1 | <u>REFERENCES</u> | .1 | Seismic protection measures must meet the requirements of the Building Code of Quebec. |
| | | .2 | The design must comply with the following documents: <ul style="list-style-type: none">– SMACNA, Seismic Restraint Manual Guidelines for Mechanical Systems.– Seismic Data project area.– NBC 2010 |
| 1.2 | <u>SCOPE OF WORK</u> | .1 | Supply and install a complete seismic fasteners against vibration isolated or not isolated as required for electrical equipment and related systems as indicated in the drawings and specifications of the Annex to this section on "Devis d'exécution fixations parasismiques. Électricité " |
| 1.3 | <u>QUALIFICATION OF THE MANUFACTURER</u> | .1 | Providing antivibration devices including seismic dampers, seismic shocks separated, mounting hardware and cables relaxed other fastening systems from manufacturers that regularly produce the same hardware. |
| | | .2 | The entire seismic fastening system shall be provided by one supplier. |
| 1.4 | <u>SHOP DRAWINGS</u> | .1 | Present shop drawings in accordance with Section 26 05 00 - General Requirements. |
| | | .2 | Provide shop drawings and data sheets for each of the separate systems and fixing devices for seismic equipment. |
| | | .3 | Shop drawings shall be sealed by an engineer specializing in earthquake fasteners and current member of the Order of Engineers of Quebec. |
| | | .4 | Once construction is completed, the Contractor shall deliver to the department's representative the full set of original construction documents, revised to reflect conditions of the system as built. |
| | | .5 | Certificates: submit certificates signed by manufacturer certifying that products, materials and equipment meet the requirements as to the physical characteristics and performance criteria. |
| | | .6 | Instructions: Submit installation instructions provided by the manufacturer. |
| | | .7 | Documents / Items to give on completion of work |
| | | .1 | Provide reports with signature checks done on site by the engineer in the design of seismic restraint systems for the oversight of the installation. |

- .2 Provide the required documents, which should include instructions to control devices and systems for seismic protection, and into manual specified in Section 26 05 00 - Electrical - General Requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 The products must be installed in accordance with the Annex to this section on " Devis d'exécution fixations parasismiques. Électricité »
- .2 The size and shape of the bases and the performance characteristics of anti-vibration devices must comply with manufacturer's recommendations and instructions.
- .3 Performs fabrication and installation of protective devices against earthquakes as recommended by the Quebec Construction Code, current edition.
- .4 Fasteners installed seismic networks of pipes, bars and sheathed cable shelves must be compatible with the requirements guide anchor these networks.
- .5 The use of cast iron supports made of threaded pipe or other materials a brittle is prohibited.
- .6 The seismic devices placed on networks of conduits, bus ducts, cable shelves and other related fasteners attached to the equipment must be compatible with the vibration and seismic devices for the component.
- .7 The seismic protection devices must not interfere with some firewall devices or compromising their integrity.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 According to articles and details of the Annex to this section on " Devis d'exécution fixations parasismiques. Électricité »

3.2 INSPECTION

- .1 At the end of the work, the engineer will inspect seismic systems. It will issue a report or a signed letter certifying compliance of facilities with regard to seismic standards specified and to the various manufacturers' recommendations.

END OF SECTION

PART 1 – GENERAL

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| 1.1 | <u>SECTION CONTENTS</u> | <p>This section specifies the materials and components for dry type transformers up to 600 V primary, equipment identification and transformer installation.</p> <p>It does not include isolation transformers, boosters and transformers equipped with a special envelope.</p> |
| 1.2 | <u>REFERENCES</u> | <p>.1 Canadian Standard Association (CSA International).</p> <p>.1 CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type).</p> <p>.2 CSA C9, Dry-Type Transformers.</p> <p>.3 When available, transformers will be required to comply with energy efficiency standard CSA C802.2 current edition, and bear the certification label CSA verified on the transformer.</p> <p>.2 National Electrical Manufacturers Association (NEMA).</p> |
| 1.3 | <u>SHOP DRAWINGS AND PRODUCT DATA</u> | <p>.1 Submit shop drawings and product data in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – General Requirements.</p> |
| 1.4 | <u>WASTE MANAGEMENT AND DISPOSAL</u> | <p>.1 Separate waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.</p> <p>.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.</p> <p>.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.</p> <p>.4 Divert unused wiring materials from landfill to metal recycling facility as approved by the department's Representative.</p> <p>.5 Fold up banding, flatten and place in designated area for recycling.</p> |
| 1.5 | <u>SEISMIC FASTENERS</u> | <p>.1 Supply and install all necessary equipment for seismic mountings as described in Section 26 10 00 – Seismic Fasteners.</p> |
| 1.6 | <u>ELECTRICAL APPARATUS PROTECTED BY SPRAY NOZZLES</u> | <p>.1 Provide and install necessary materials in accordance with Section 26 05 00 – General Requirements.</p> |

PART 2 – PRODUCTS

2.1 TRANSFORMERS

- .1 Use transformers of one manufacturer throughout project.
- .2 Description:
 - .1 Type: ANN.
 - .2 3 phase, power as indicated, input voltage of 600V delta connected, output voltage of 120/208 V star connected, frequency of 60 Hz.
 - .3 Single phase, power as indicated, input voltage of 600 V and output voltage of 120/240 V, 60 Hz frequency
 - .4 Insulation Class H, temperature elevation of 150°C. and 30-40°C speaker, ventilated steel, isomode vibration damper up to 1 200 V, 25 kV for more than 1 200 V.
 - .5 Voltage impulse: 10 kV.
 - .6 Standard electric strength.
 - .7 Average sound level:
 - .1 Three-phase:
45 dB(A) maximum for 10 kVA to 50 kVA ;
50 dB(A) maximum for 51 kVA to 150 kVA ;
55 dB(A) for 151 kVA to 300 kVA.
 - .2 Single phase:
50 dB(A) maximum for 10 kVA to 50 kVA ;
55 dB(A) maximum for 51 kVA to 100 kVA ;
60 dB(A) for 101 kVA to 167 kVA.
 - .8 Impedance at 150°C of heating of the coil in a room temperature between 30-40 ° C
 - .1 Three-phase transformers of 150 kVA and less:
4,0 % min. to 6,5 % max.
 - .2 The impedance described above is based on Delta transformers.
 - .9 35% efficiency of 75°C load:
 - .1 For transformers up to 50 kVA : 97 % minimum.
 - .2 For transformers from 75 kVA to 300 kVA : 98 % minimum.

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| | .10 | Enclosure: NEMA 2, removable metal front panel, waterproof. |
| | .11 | Mounting: floor or wall, as indicated. Wall mounting is recommended. |
| | .12 | Light gray finish ASA n° 61, as indicated in Section 26 05 00 – General Requirements. |
| | .13 | Center tap 2FCAN and 2FCBN, 4 x 2,5 %. |
| | .14 | Winding: copper or aluminum. The copper winding is prioritized (design plan). The aluminum coil is accepted if it meets the installation requirements. The contractor will be responsible of validating on site the required spacing with the other components in accordance with codes and standards. |
| | .15 | Testing: in accordance with Chapter 7, ACNOR C9 standard, current edition, dry type transformers. |
| | .16 | Zigzag type 0 ° and 30 ° for harmonics cancellation, as indicated. |
| | .17 | K-13 factor to support harmonics, as indicated. |
| | .18 | 10 year prorated warranty. |
| | .19 | Simple electrostatic shield. |
| | .20 | Secondary treatment of harmonics 3 °, 9 °, 15 ° and 5 °, 7 °, 17 °, 19 ° with 30 ° phase shift on common primary circuit. |
| | .21 | Neutral ability at 200 % of nominal secondary phase current. |
| | .22 | Voltage distortion tested on a test bench for nonlinear loads and certified performance tested on a test bench for nonlinear loads. |
| | .23 | The coils and core of all transformers must be mounted on vibration dampers. |
| 2.2 | <u>EQUIPMENT IDENTIFICATION</u> | |
| | .1 | Provide equipment identification in accordance with Section 26 05 00 – General Requirements. |
| | .2 | Label: format 7 with identification as indicated. |
| 2.3 | <u>MANUFACTURERS</u> | |
| | .1 | Accepted products: Delta, Square-D, Hammond, Marcus, Siemens. |

PART 3 – EXECUTION

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| 3.1 | <u>INSTALLATION</u> | .1 | Mount dry type transformers up to 75 kVA as indicated. |
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- .2 Mount dry type transformers above 75 kVA on floor.
- .3 The mounted transformers base must not exceed 3 meters above the finished floor
- .4 Ensure adequate clearance around transformer for ventilation in accordance with Construction Code of Québec, Chapter V – Electricity (current edition).
- .5 Install transformers in level upright position.
- .6 Remove shipping supports only after transformer is installed and just before putting into service.
- .7 Loosen isolation pad bolts until no compression is visible.
- .8 Install transformers on anti-vibration pads.

3.2 TERMINATIONS

- .1 Make connections using flexible metal conduit in primary and secondary as indicated on wiring diagram.
- .2 If possible, switch transformers on immediately after installation.

END OF SECTION

PART 1 – GENERAL

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| 1.1 | <u>SECTION CONTENTS</u> | | This section specifies standard and custom panelboards and their installation. |
| 1.2 | <u>REFERENCES</u> | .1 | Canadian Standard Association (CSA International). |
| | | .1 | CSA C22.2 No 29, Panelboards and Enclosed Panelboards. |
| 1.3 | <u>SHOP DRAWINGS AND PRODUCT DATA</u> | .1 | Submit shop drawings and product data in accordance with Sections 26 05 00 – General Requirements and 01 33 00 – Submittal Procedures. |
| | | .2 | Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimensions. |
| 1.4 | <u>PANELBOARDS DESCRIPTION</u> | .1 | To see panelboards description, refer to Section 26 05 05 – Scope of work, Specific Clauses, Descriptions and Lists. |
| 1.5 | <u>SEISMIC FASTENERS</u> | .1 | Provide and install all necessary seismic fasteners in accordance with Section 26 10 00. |
| 1.6 | <u>ELECTRIC GEAR PROTECTED BY SPRINKLERS</u> | .1 | Provide and install materials in accordance with Section 26 05 00 – General Requirements. |
| 1.7 | <u>WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Separate and recycle waste materials in accordance with Section 01 74 00 – Construction/Demolition Waste Management and Disposal. |
| | | .2 | Remove from site and dispose of packaging materials at appropriate recycling facilities. |
| | | .3 | Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | | .4 | Divert unused metal and wiring materials from landfill to metal recycling facility approved by the department's Representative. |

PART 2 – PRODUCTS

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| 2.1 | <u>PANELBOARDS</u> | .1 | Panelboards of one manufacturer. |
| | | .1 | Install circuit breakers in panelboards before shipment. |
| | | .2 | In addition to CSA requirements, manufacturer's nameplate must show fault current that panel including breakers has been built to withstand. |

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| | .2 | 250V and 600V Panelboards: bus and breakers rated as indicated on shop drawings. A symmetrical interrupting capacity 22 000 A or as indicated. |
| | .3 | Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase. |
| | .4 | Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated. |
| | .5 | Two keys for each panelboards and key panelboards alike. |
| | .6 | Copper or aluminum bus with neutral of same ampere rating as mains. |
| | .7 | All tables must have bar grounding. |
| | .8 | Mains: suitable for bolt-on breakers. |
| | .9 | Trim with concealed front bolts and hinges. |
| | .10 | The front panel must be fitted with hinged left and right retaining bolts (door in door) to facilitate access for maintenance personnel. |
| | .11 | Trim and door finish: baked grey enamel. |
| | .12 | For all unused spaces, install devices for adding breakers later. |
| 2.2 | <u>SERIAL PROTECTION</u> | |
| | .1 | The panels must be downstream full value or integrated protective equipment value with protection upstream. If the manufacturer decides to go with the second option, he must provide proof from testing laboratory certifying the proper functioning of equipment and indicate on a nameplate the testing current (kA rms. Bal.) of protection device equipment with specific upstream bypass arrangements eligible, the designation of the panel and voltage, as mentioned in section 14-014 of the Building Code of Quebec, Chapter V, Electricity. |
| | .2 | No integral protection (series) will be accepted for capacity of more than 400A. |
| | .3 | No integral protection (serial) will be accepted on the network emergency. |
| | .4 | No integral protection (series) will be accepted if the sum of the rated currents of motors connected directly between the devices connected in series is greater than 1% of rated breaking capacity of the downstream circuit breaker. |
| 2.3 | <u>CUSTOM BUILT
PANELBOARDS
ASSEMBLIES</u> | |
| | .1 | 125 mm relay section on one or both sides of panels as indicated for installation of low voltage remote control switching components. |

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| | .2 | Double stack panels as indicated. |
| | .3 | Contactors in mains as indicated. |
| | .4 | Feed through lugs as indicated. |
| | .5 | Isolated ground bus. |
| 2.4 <u>BREAKERS</u> | .1 | Breakers: to Section 26 28 21 – Moulded Case Circuit Breakers. |
| | .2 | Breakers with thermal and magnetic stripping in panelboards except as indicated otherwise. |
| | .3 | Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker. |
| | .4 | Lock-on devices for receptacles, fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits. |
| 2.5 <u>EQUIPEMENT IDENTIFICATION</u> | .1 | Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical. |
| | .2 | Nameplate for each panelboard size 4 engraved as indicated. |
| | .3 | Nameplate for each circuit in distribution panelboards size 2 as indicated. |
| | .4 | Complete circuit directory with typewritten legend showing location and load of each circuit. |
| 2.6 <u>MANUFACTURERS</u> | .1 | Accepted products: Cutler-Hammer Siemens, Square D or GE. |

PART 3 – EXECUTION

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| 3.1 <u>INSTALLATION</u> | .1 | Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces. |
| | .2 | Install surface mounted on panelboards on plywood backboards. Where practical, group panelboards on common backboards. |
| | .3 | Mount panelboards to height specified in Section 26 05 00 – Common Work Results – Electrical or as indicated. |
| | .4 | Connect all circuits to load elements. |
| | .5 | Connect neutral conductors to common neutral bus with respective neutral identified. |
| | .6 | When there are distribution panels installed side by side, boxes must be welded together and be of same size, lids must be separated, doors of the same size and must be perfectly aligned. |

- .7 Provide each circuit taken at 120 VAC and services of its own neutral conductor and do not use common neutral multi-circuit. The derivations of lighting can be provided with a common neutral with the Code of Construction of Québec, chapter V, electricity.
- .8 Each time the panel will be installed flush, install three Ø 27 mm empty ducts into the ceiling space and three Ø 27 mm ducts into the ceiling space of the lower floor (if applicable). If no ceiling was provided, finish the ducts as high as possible between the floor structures or provide an access door 300 x 600 mm to 300 mm above the panel.
- .9 The connection of branch lines to the panel should be made on the sides of the distribution panels. Only the supply conduits can be connected to the top or bottom.

END OF SECTION

PART 1 – GENERAL

1.1	<u>SECTION CONTENT</u>	.1	Switches, outlets, cover plates and other wiring devices and their installation.
1.2	<u>REFERENCES</u>	.1	Canadian Standards Association (CSA International).
		.1	CSA-C22.2 No. 42, General Use Receptacles, Attachment Plugs and Similar Devices.
		.2	CSA-C22.2 No. 42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
		.3	CSA-C22.2 No. 55, Special Use Switches.
		.4	CSA-C22.2 No. 111, General-Use Snap Switches (National standard, with UL 20, current edition).
1.3	<u>SHOP DRAWINGS AND PRODUCT DATA</u>	.1	Submit shop drawings and product data in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – General Requirements.
		.2	Submit a set of drawings for each model of electrical outlets and switches specified.
		.3	The drawings shall clearly identify the following: <ul style="list-style-type: none">- Manufacturer- Model- Description- Amperage and voltage- Nema Configuration- Catalog Number- Color- Performance:<ul style="list-style-type: none">. Electrical. Mechanical. Environmental- Material:<ul style="list-style-type: none">. Front. Rear body. Contact- Dimensions
1.4	<u>WASTE MANAGEMENT AND DISPOSAL</u>	.1	Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility proposed by Consultant and approved by the department's Representative.

PART 2 – PRODUCTS

2.1 SWITCHES

- .1 Switches: single pole, double pole, three-way or four-way switches, 15 or 20 amp, 120-277 V ac or 347 V ac as indicated.
- .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 Toggles: in white or as indicated by the Architect.
- .3 Toggles operated fully rated for tungsten filament and fluorescent lamps, and up to 120% of rated capacity for motor loads.
- .4 For all of the installation, use only switches manufactured by a single manufacturer.

.5 Accepted products:

	Hubbell	Leviton	Seymour
.1 120V 15A 1 pole	HBL1201W	1201-2W	PS15AC1W
.2 120V 20A 1 pole	HBL1221W	1221-2W	PS20AC1W
.3 347V 15A 1 pole	HBL18201WCN	18201-W	PS371510W
.3 347V 15A 1 pole	HBL18203WCN	18221-W	PS372010W

2.2 DIMMERS FOR INCADESCENT BULBS

- .1 Dimmer compliant with CSA C22.2 n° 184.1, allowing to vary the brightness on a palm between 0 % and 100 % following a quadratic curve consistent and continuous, and with following characteristics:
- .1 For installation in a single switch box.
 - .2 Can be mounted without the need for bulk removal of side walls or decommissioning of electrical power to 1000 watts.
 - .3 Circuit advanced semiconductors, providing a sinewave AC ballast low voltage magnetic shunt.
 - .4 Two mobile parts:
 - .1 Single pole or three-way switch, as indicated.
 - .2 Long life potentiometer.
 - .5 Controlled by switching on and off button without changing the preset light intensity.
 - .6 Rated for 120 V AC, as indicated.
 - .7 Providing a regulated voltage accuracy of $\pm 5\%$ lumen for a voltage variation of $\pm 10\%$.
 - .8 No perceptible flicker at any point of adjustment range, and no perceptible hum.
 - .9 RFI filter (audio, radio and television).
 - .10 For operation at an ambient temperature of 0 ° C to 40 ° C.

2.3 OUTLETS

- .1 Outlets to 125 VAC, depending on the following accepted manufacturers:

		Hubbell	Leviton	Pass & Seymour
.1	Single 15 A Conf. 5-15R	HBL5251	5251-W	5261
.2	Double 15 A Conf. 5-15R	HBL5262W	5262-W	5262AW
.3	Double 15 A Conf. 5-15R Emergency	HBL5262R	5262-R	5262ARED
.4	Double 15 A Conf. 5-15R Computer Room	IG5262	5262-IG	IG5262

		<u>Hubbell</u>	<u>Leviton</u>	<u>Pass & Seymour</u>
.5	Double 20 A Conf. 5-20R	HBL5362W	5362-W	5362AW
.6	Single 30 A Conf. 5-30R	HBL9308	5371	3802
.7	Single 15 A Lockable Conf. L5-15R	HBL4710	4710	4710
.8	Double 15 A Lockable Conf. L5-15R	HBL4700	4700	4700
.9	Single 20 A Lockable Conf. L5-20R	HBL2310	2310	L520-R
.10	Double 15 A DDFT Conf. 5-15R	GF5262WA	7599-W	N/A
.11	Double 20 A DDFT Conf. 5-20R	GF5362WA	7899-W	N/A
.12	Double 15 A Hospital Grade Conf. 5-15R	HBL8200W	8200-W	8200W
.13	Double 20 A Hospital Grade Conf. 5-20R	HBL8300W	8300-W	8300W
.14	Double 15 A DDFT (Hospital Grade) Conf. 5-15R	GF8200WA	7599-HGW	1595-HGW
.15	Double 20 A DDFT (Hospital Grade) Conf. 5-20R	GF8300WA	7899-HGW	2095-HGW
.2	120/240 V ac outlets:			
		<u>Hubbell</u>	<u>Leviton</u>	<u>Pass & Seymour</u>
.1	Single 30 A Conf. 14-30R	HBL9430A	278	3864
.2	Single 50 A Conf. 14-50R	HBL9450A	279	3894
.3	Outlets: white, or as indicated by the Architect (except emergency network UPS, computer).			
.4	Special network outlets:			
	<ul style="list-style-type: none"> - Red : Emergency network - Blue: UPS network - Orange (with isolated grounding) : Computer 			

2.4 <u>SPECIAL WIRING DEVICES</u>	.1	Special wiring devices
	.1	Clock hanger outlets, 15 A, 125 V, 3 wire, grounding type, suitable for No. 10 AWG for installation in flush outlet box.
	.2	Lamps: as indicated, equipped with an LED lamp or neon of 0,04 W, 125 V red plastic, built-in.
	.3	Motion Detectors: as indicated, infrared and/or ultrasound for wall or ceiling complete with all necessary accessories for a complete assembly.
	.4	Tape clear plastic identification, typed in black, as indicated. Manufacturer accepted: E-Z-CODE Thomas & Betts.
2.5 <u>COVER PLATES</u>	.1	Cover all devices and wiring boxes for telephone, cable and computer conduit systems with cover plates.
	.2	For the entire system, use only cover plates made by a single manufacturer: Hubbell, Leviton or Pass & Seymour.
	.3	Plate lids galvanized steel junction boxes for surface-mounted.
	.4	Plate covers nonmagnetic stainless steel (# 302) brushed vertically 1 mm thick for wiring devices hospital grade type mounted in outlet boxes or recessed surface.
	.5	Stainless steel cover plate (# 430) brushed vertically 1 mm thick for wiring devices mounted in outlet boxes or recessed surface.
	.6	Cover plate moulded aluminum, weatherproof, double-leaf spring with gaskets for electrical outlets doubles, as indicated.
	.7	Cast aluminum cover plate, spring, weather-resistant, with gaskets for electrical outlets and switches simple, as indicated.
	.8	Nylon or plastic plates, as indicated, the same color as the device wiring for homes.
2.6 <u>JIFFY POLES</u>	.1	Service pin aluminum profile Satin gray finish with two 5-15R duplex receptacles wired at the factory for a tour that ends in between the ceilings by a flexible cord with plug and grounding the column exceeding 6 m, and two knockouts for telecommunication closed by a plate.
	.2	Pillars with two separate compartments for electricity and telecommunications are all accessible by a removable cover.
	.3	Outlets and telecommunications outlets shall be located on the same side of the column.

- .4 Attachment devices for suspended ceiling adjustable bar "T" or inverted concrete slab (as applicable) and low slip to the floor.
- .5 Dimensions: 2 1 / 8 in. x 2 1 / 8 x 9 '6"(height necessary to change depending on the height of the ceiling or slab as applicable).
- .6 Positioning of the outputs (the center axis of the device):
 - .1 Outlets: 533 mm and 635 mm.
 - .2 Telecommunication outlets: 278 mm and 381 mm.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Switches and dimmers:
 - .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 and dimmers at height in accordance with Section 26 05 00 – Common Work Results – Electrical.
- .2 Outlets:
 - .1 Install outlets in gang type outlet box when more than one outlet is required in one location.
 - .2 Mount outlets at height, in accordance with Section 26 05 00 – Common Work Results – Electrical.
 - .3 Where split outlets has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
 - .1 Protect stainless steel cover plates finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
 - .4 Identify the panel number and circuit number corresponding to all devices and wiring junction boxes, using an adhesive tape white plastic type P-Touch. The adhesive tape shall exceed the width of the plate, 10 mm on each side, to return and paste in the back.

Lettering color:

Normal type network: black

Emergency type network: red

Other networks: to coordinate.

.4 Jiffy poles:

- .1 Install the poles as indicated in the plan. Coordinate with the final development positions and orientations.
- .2 If necessary, change the height on site depending on the type of ceiling and its composition. The amendment will be made on the upper end of the column.

.5 FS and FD box types:

- .1 Coordinate with the general contractor install recessed cans so that the surface of the box is flush with the wall surface. Provide a seal around the box before installing the cover plate.

.6 General:

- .1 Outputs and dimmers location in accordance with Section 26 05 00 – General requirements, or as indicated.

FIN DE LA SECTION

PART 1 – GENERAL

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|--|----|---|
| 1.1 <u>REFERENCES</u> | .1 | Canadian Standard Association (CSA International) |
| | .1 | HRC fuses with high breaking capacity, type specified below, according to the standard C22.1 and C22.2 106. |
| | .2 | Low-voltage fuses conform to CSA C22.2 No. 248. |
| | .3 | Plug and cartridge fuses in accordance with CSA C.22.2 No. 59. |
| 1.2 <u>ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Provide submittals in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – Common Work Results for Electrical. |
| 1.3 <u>SHOP DRAWINGS AND PRODUCT DATA</u> | .1 | Submit shop drawings and product data in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – Common Work Results for Electrical. |
| | .2 | Submit specifications for each type of fuses of size greater than 5 A. The characteristics should include: the average time to fusion given current intensity, the value I^2t (to establish the coordination of fuses) and the peak current eligible. |
| | .1 | Shop drawings submitted must, where required, bear the seal and signature of a qualified engineer authorized or entitled to practice in Quebec. |
| 1.4 <u>DELIVERY, STORAGE, AND HANDLING</u> | .1 | Ship fuses in original containers. |
| | .2 | Do not ship fuses installed in switchboards. |
| | .3 | Store fuses in original containers in a storage cabinet in a moisture free location. |
| | .4 | Waste management and disposal: |
| | .1 | Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal. |
| 1.5 <u>EXTRA MATERIALS</u> | .1 | N/A |
| | .2 | Provide three spare fuses of each type and size installed above 600A. |
| | .3 | Provide six spare fuses of each type and size installed up to and including 600A. |

PART 2 – PRODUCTS

- 2.1 FUSES – GENERAL .1 Fuses: product of one manufacturer.
- 2.2 FUSE TYPES .1 Main, by-pass, and distribution switch:
- .1 Circuits 601 to 6000A will be protected by current-limiting fuses Class L-timer. The fuses can withstand a current corresponding to 500% it's rated current for at least four seconds and be CSA certified with a capacity of 200 kA rms interruption of sym.
- Such as Mersen fuses: A4BQ, A4BY, A4BT (equivalent accepted: refer to article 2.3.1)
- .2 Circuits 600A and less will be protected by current-limiting fuses. The fuses can withstand a current corresponding to 500% it's rated current for at least 10 seconds and will be CSA certified with a capacity of 200 kA rms interruption of sym.
- Such as Mersen fuses: AJT, A6D-R (600V), A2D-R (250V), TRS-R (600V), TR-R (250V) (accepted equivalent: refer to article 2.3.1)
- .2 Motor Protection:
- .1 All individual circuits for motors will be protected with delayed action fuses: Class J, Class RK1, Class RK5, Class CC, Class L or Class C.
- Such as Mersen fuses: (accepted equivalent: refer to article 2.3.1) :
- Class RK1: A2D-R (250V) or A6D-R (600V)
Class J: AJT
Class L: A4BQ, A4BY, A4BT
Class RK5: TR-R (250V) or TRS-R (600V)
Class CC: ATDR
Class C: FES, FESF, FESC
- .3 Lightning and control circuits:
- .1 The circuits will be protected with delayed action fuses Class CC.
- Such as Mersen fuses (accepted equivalent: refer to article 2.3.1) :
- Class CC – ATDR, ATQR
- .4 Variable frequency drives:
- .1 The circuits will be protected by fast acting Class J fuses.
- Such as Mersen fuses (accepted equivalent: refer to article 2.3.1) :

Class J – HSJ

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|-----|-----------------------------|----|---|
| 2.3 | <u>MANUFACTURERS</u> | .1 | Accepted Manufacturers: Mersen (Ferraz Shawmut), Cooper Bussmann, Little Fuse, Fusetek. |
| 2.4 | <u>FUSE STORAGE CABINET</u> | .1 | Fuse storage cabinet, manufactured from 2.0 mm thick aluminum, 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00 – Common Work Results for Electrical. |

PART 3 – EXECUTION

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| 3.1 | <u>INSTALLATION</u> | .1 | Install fuses in mounting devices immediately before energizing circuit. |
| | | .2 | Ensure correct fuses fitted to physically match mounting devices. |
| | | .1 | All equipment to fuse a current rating of 600A or less will be equipped with clamp removal in the case of classes R and J. |
| | | .3 | Ensure correct fuses fitted to assigned electrical circuit. |
| | | .4 | When Class R fuses are prescribed; ask about the equipment warning labels marked "Use only replacement fuses of the class R". |
| | | .5 | Use fast acting fuses for resistive loads. |
| | | .6 | Use of delayed action fuses for other types of load. |
| | | .7 | Select the fuse capacity according to the current measured load of each driving force. |
| | | .8 | Install the storage cabinet at the place designated by the electricity representative and the CDC representative. |
| | | .9 | Install spare fuses in fuse storage cabinet. |
| | | .10 | Install inside the door of each piece of equipment with a fuse plate "lamicoid" indicating the classes and types and the fuse rating to use. |

END OF SECTION

PART 1 – GENERAL

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| 1.1 | <u>SECTION CONTENTS</u> | .1 | Moulded case circuit breakers materials, circuit breakers and protection against ground fault, circuit breakers, fuse and protective accessories against the high fault currents. |
| 1.2 | <u>REFERENCES</u> | .1 | Canadian Standards Association (CSA International) |
| | | .1 | CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, current edition). |
| 1.3 | <u>SHOP DRAWINGS AND
PRODUCT DATA</u> | .1 | Submit shop drawings and product data in accordance with Sections 26 05 00 – General Requirements, and 01 33 00 – Submittal Procedures. |
| | | .2 | Include the characteristic curves established according to the constant time-current for circuit breakers with a capacity of 100 A or more, or with a breaking capacity of 22 000 A symmetrical and over, to the line voltage. |
| | | .3 | Provide all available data regarding the values of the capacity of power failure and short circuit I^2t maximum allowable values for all circuit breakers. |
| | | .4 | Provide the certificate of authenticity and fabrication of the circuit breaker. |
| 1.4 | <u>AUTHENTICATION</u> | .1 | Before proceeding with any installation of circuit breakers in a new or existing installation, the electrical contractor must submit three (3) copies of a certificate of authenticity from the manufacturer, in French, signed by the factory and the local representative of that manufacturer certifying that all circuit breakers are new and that they meet the standards and regulations. These certificates must be submitted to the CDC representative for acceptance. |
| | | .2 | A delay in the production of the certificate of authentication will not justify an extension of the contract and no additional compensation. |
| | | .3 | Any work of manufacturing, assembly or installation should begin only after acceptance of the certificate of authentication by the representative of CDC. Failure to comply with this requirement, the representative of CDC and / or the client user has the right to mandate the manufacturer listed on the circuit breakers to authenticate all new circuit breakers under the contract, and that, at the expense of contractor electrician. |
| | | .4 | In general, the certificate of authentication must contain: |
| | | .1 | The name and address of the manufacturer and the person responsible for the authentication. The responsible person must sign and date the certificate; |
| | | .2 | The name and address of the licensed dealer and |

distributor of the person responsible for the count of the contractor.

.3 The name and address of the contractor and the person in charge of the project.

.4 The name and address of the building where the circuit breakers will be installed:

.1 Project title (title of the specifications or plans);

.2 Client's reference number;

.3 List of circuit breakers in tabular form when required.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse and recycling and place in designated containers steel, metal, and plastic waste in accordance with Waste Management Plan.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

.1 Moulded case circuit breakers, switches, and devices for protection against ground fault, circuit breakers, fuse and protective accessories against the high fault currents.

.2 Moulded Case Circuit Breakers, bolted or plug to the bus bars, quick-closing type and snap-action, manually operated and automatic, with compensation for an ambient temperature of 40°C.

.3 Common-trip circuit breakers, equipped with a single handle for multi-pole circuits.

.4 Breakers equipped with magnetic snap-action trips, designed to act only when the current value reaches the setting value.

.5 Circuit breakers equipped with interchangeable trips, as indicated.

2.2 OPTIONAL FEATURES

.1 Include:

.1 Shunt trip.

.2 Auxiliary switch.

.3 Motor-operated mechanism.

.4 Under-voltage release.

.5 On-off locking devices.

.6 Handle mechanism.

2.8 MANUFACTURERS

.1 Accepted products: Cutler-Hammer, Siemens, Scheider Electric, GE.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

.2 Install locking devices on circuits listed in Section 26 24 16.01 – Panelboards Breaker Type.

.3 The order in which circuit breakers should be installed in the panels must meet the one shown in the plans.

FIN DE LA SECTION

PART 1 – GENERAL

1.1	<u>SECTION CONTENTS</u>	.1	Materials, hardware for switches fused and non-fused, and their installation.
1.2	<u>REFERENCES</u>	.1	Canadian Standards Association (CSA International).
		.1	CAN/CSA C22.2 No. 4, Enclosed Switches.
		.2	CSA C22.2 No. 39, Fuseholder Assemblies.
1.3	<u>SHOP DRAWINGS AND PRODUCT DATA</u>	.1	Submit shop drawings and product data in accordance with Sections 26 05 00 – General Requirements and 01 33 00 – Submittal Procedures.
1.4	<u>HEALTH AND SAFETY</u>	.1	Do construction occupational health and safety.
1.5	<u>WASTE MANAGEMENT AND DISPOSAL</u>	.1	Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
		.2	Remove from site and dispose of packaging materials at appropriate recycling facilities.
		.3	Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
		.4	Separate for reuse and recycling and place in designated containers steel, metal, and plastic waste in accordance with Waste Management Plan.
		.5	Fold up metal banding, flatten and place in designated area for recycling.
1.6	<u>ELECTRICAL EQUIPEMENT PROTECTED BY SPRINKLERS</u>	.1	Provide and install materials in accordance with Section 26 05 00 – General Requirements.

PART 2 – PRODUCTS

2.1	<u>DISCONNECT SWITCHES</u>	.1	Fused and non-fused switches, in CSA enclosure:
		.1	Type 1 for indoor use in ordinary locations.
		.2	Type 2 for outdoor use, where the envelope is exposed to fluid leaking.
		.3	Type 3R for outdoor use.
		.4	Type 4 for use where the envelope is exposed to direct water.

- .5 Type 5 for indoor use in locations where dust, lint, or particles are not dangerous, or are likely to be deposited or suspended in the atmosphere.
- .2 Possibility to lock in "closed" or "open" positions, with three locks.
- .3 Mechanical door with interlock, prohibiting the opening when the lever is in "closed" position.
- .4 Bypass mechanism allowing opening the enclosure when the switch is "ON".
- .5 Closing and abrupt cut-off mechanism.
- .6 "Open" and "Closed" indication on the enclosure lid.
- .7 Fuses: rating in accordance with Section 26 28 13.01.
- .8 Fuse holders: movable and suitable, without an adapter, to the type and fuse rating indicated.
- .9 A set of auxiliary contacts CSA certified is required when used for elevators, escalators, hoists, engine stairwell pressurization of a fire alarm or via a variable frequency drive. All auxiliary contacts shall be of type "open advanced".
- .10 At 120/240 V, single phase, three cords, to 120/208 V, three phase, four cords and 347/600 V, three phase, four cords, the switches will be equipped with a solid neutral.
- .11 All switches must be provided by the same manufacturer.

2.2 EQUIPEMENT IDENTIFICATION

- .1 Nameplates provided and installed in accordance with Section 26 05 00 – General Requirements.
- .2 Indicate name of load controlled on size 4 nameplates.

2.3 MANUFACTURER

- .1 Accepted products: Cutler-Hammer, Siemens, Square D, GE.
- .2 The switches manufacturer must be the same as the electrical distribution panels unless stated otherwise.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable, as indicated.
- .2 Install contacts sets required by 2.1.9 and the necessary wiring (although not shown in plans) between the switches and the variable frequency drive upstream (connection in series with the termination of the variable frequency drive).

FIN DE LA SECTION

PART 1 – GENERAL

- 1.1 REFERENCES
- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
 - .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - .3 ASTM International Inc.
 - .1 ASTM F 1137, Standard Specification for Phosphate/ Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
 - .4 Canadian Standards Association (CSA International)
 - .1 ACNOR C22.2 n° 9, for lighting.
 - .2 ACNOR C22.2 n° 43, cap screwed sockets.
 - .3 ACNOR C22.2 n° 74, discharge lamp sockets.
 - .4 ACNOR C22.2 n° 4, incandescent lamps.
 - .5 ACNOR C22.2 n° 141, emergency lighting.
 - .5 ICES-005, Radio Frequency Lighting Devices.
 - .6 Underwriters' Laboratories of Canada (ULC)
 - .7 All lighting must comply with the Building Code of Quebec, Electricity.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – General Requirements.
 - .2 Quality assurance submittals: provide following in accordance with Section 01 45 00 – Quality Control
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures, etc.

1.3 SHOP DRAWINGS
AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Sections 26 05 00 – General Requirements and 01 33 00 – Submittal Procedures.
- .2 The drawings must come from the company that makes devices and include, in the same shipment, the drawings of lamps and ballasts with their characteristics.
- .3 During the presentation of shop drawings, submit data sheets indicating the mercury content of products used and calculations show the ratio of mercury per lumen hour (hg / lm-hr) for all the lamps used the project.
- .4 Product Data:
 - .1 Provide manufacturer's printer product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 The photometric data must be established by an independent testing laboratory, and must include: the total power consumption (in watts), the light intensity (in candelas), the spectral distribution, the luminous flux (lumens), the performance standard the luminaire, the utilization factor, the type of lamp, ballast type and description of the company.
- .5 This data must include the following, if applicable: table showing CVP rate and aircraft separation criteria.
- .6 For any product covered by the equity method agreed with this estimate; provide point by point calculation of local and external spaces.

1.4 DELIVERY, STORAGE AND
HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Deliver materials to sit in original factory packaging, labelled with manufacturer's name and address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management Disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

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|------------------------------|--|----|---|
| 1.5 | <u>EARTHQUAKE RESISTANT
FIXING</u> | .1 | Supply and install all necessary equipment for earthquake resistant fixing in accordance with Section 26 10 00 – Earthquake Resistant Fixing. |
|
<u>PART 2 – PRODUCTS</u> | | | |
| 2.1 | <u>MATERIALS</u> | .1 | Provide lighting interior and exterior devices described in Section 26 05 05, complete with all accessories required for installation and operation, such as ballasts, plaster frames, suspensions, gaskets, insulation, lamps, etc. Fluorescent lamp sockets coated with a silver plating to ensure positive contact of the lamps for a full installation. |
| | | .2 | All lamp and ballast must be from the same manufacturer. A minimum guarantee of three years for the whole must be provided by the manufacturer. |
| | | .3 | Accepted products: |
| | | .1 | Fluorescent light fixtures: Williams, Cooper (Metalux), Peerless, Canlyte-CFI, Hubbell, Thomas et Day-Brite. |
| | | .2 | Incandescent light fixtures: Lightolier, Halo, Prescolite, Hubbell. |
| | | .3 | LED lighting fixtures: CFI, Thomas, Cooper. |
| | | .4 | HID lighting fixtures: Ruud, Lumec, Keene, Widelite, Prescolite, Hubbell et Day-Brite. |
| | | .5 | Explosion-proof and corrosive devices: Appleton, Thomas & Betts, Crouse-Hinds, Ipex, Hubbell. |
| 2.2 | <u>LAMPS</u> | .1 | The lamps capacity shall not exceed the recommendations of the manufacturer of the device. |
| | | .2 | All lamps must be in place and in good condition at the date of provisional acceptance. |
| | | .3 | All incandescent lamps and tungsten halide that have burned in the three (3) months from the date of provisional acceptance will be replaced. |
| | | .4 | All fluorescent lamps and high intensity discharge bulbs burned in the 12 months from the date of provisional acceptance will be replaced. |
| | | .5 | Provide 5% of the total number of each type of lamps installed as spares (minimum one (1) lamp). |
| | | .6 | All chosen lamps must have a general average grade of 70 pictograms of mercury per lumen hour. |
| | | .7 | The lamps should be non-cycling at the end of life. |
| | | .8 | Supply and install all the lights required for each fixture. All lamps must come from the same manufacturer |

.9 Accepted products: Philips (ALTO I/II), G.E. (Ecolux), Osram-Sylvania (Ecologic).

.10 Incandescent and tungsten halogen lamps:

Bulb shape and power, in watts	Base	Initial lumens (approx.)	Life length, in hours	Description	Volts
A19-100	medium	1270	6000	Frosted inside	120-125
Par20-50	medium	600	2500(5000)	Tungsten halogen	130
Par20-75	medium	1100	2500(5000)	Tungsten halogen	130

.11 Fluorescent lamps, of ecological type, with appropriate marking:

Bulb shape and power, in watts	Base	Initial lumens (approx.)	Life length, in hours	Color temperature (approx.)	Minimum Color Rendering
T5-28	Miniature 2 pins	2900	20000	4100° K	85
T5-54	Miniature 2 pins	5000	25000	4100° K	85
T8-28	Miniature 2 pins	2725	24000	4100° K	85
T8-32	Miniature 2 pins	3000	24000	4100° K	85

Unless indicated otherwise, fluorescent tubes will be of T-8 type, 32 W, 4100 ° K in general, 24 000 hours and a color rendering (CRI) of minimum 85 at low mercury content (green).

.12 Compact fluorescent lamps, of ecological type, with appropriate marking:

Bulb shape and power, in watts	Base	Initial lumens (approx.)	Life length, in hours	Color temperature (approx.)	Minimum Color Rendering
PL-T-17	4 pins	1200	10000	4100° K	82
PL-T-26	4 pins	1800	10000	4100° K	82
PL-T-32	4 pins	2400	12000	4100° K	82
PL-T-42	4 pins	3200	10000	4100° K	82

.13 Metal halide lamps:

Bulb shape and power, in watts	Base	Initial lumens (approx.)	Life length, in hours	Color temperature (approx.)	Minimum Color Rendering
BT37-400	Goliath	36000 V 32000 H	15000	4000° k	85
BT28-250	Goliath	22000 V 20000 H	10000	4000° k	85
BT28-175	Goliath	15000 V 12900 H	7500	4000° k	85
ED17-150	Medium	13000	10000	4000° k	85
ED17-100	Medium	8500	10000	4000° k	85
ED17-70	Medium	5200	10000	4000° k	85
MP70-100	Medium	3200/5600	7500	3200° k	75
MP150	Medium	8800	5000	3200° k	75

.14 High pressure sodium vapour lamps:

Bulb shape and power, in watts	Base	Initial lumens (approx.)	Life length, in hours	Temperature Color (approx.)	Minimum Color Rendering
E25-1000	Goliath	140000	24000	≥2000	22
ED18-400	Goliath	50000	24000	≥2000	22
ED18-250	Goliath	29000	24000	≥2000	22
ED18-200	Goliath	22000	24000	≥2000	22
ED17-150	Medium	16000	24000	≥2000	22
ED17-100	Medium	9500	24000	≥2000	22
ED17-170	Medium	6300	24000	≥2000	22
ED17-50	Medium	4000	24000	≥2000	22
ED17-35	Medium	2250	24000	≥2000	22

2.3 BALLASTS

- .1 Use instant start lamps and ballasts for areas where light fixtures are on most of the time. And in areas where the switches are frequent, use quick start lamps and ballasts.
- .2 All ballasts must be equipped with removable connectors.
- .3 Fluorescent Lamp Ballasts: CBM and CSA certified, low power consumption, integrated circuit or integrated circuit graduation.
 - .1 Rated voltage: 60 Hz, as indicated, designed for rapid start or instant.
 - .2 Electronic type.
 - .3 Fully boxed and designed for use at an ambient temperature of 40 ° C.
 - .4 Power factor of at least 98% of the nominal luminous flux of lamps.
 - .5 Current crest factor: 1.7 max.
 - .6 Harmonic: overall harmonic distortion of less than 10%.
 - .7 Electronic ballasts operating frequency: 20 kHz minimum.
 - .8 Noise level: Class A.
 - .9 Installation: remote or integrated to luminaire.
 - .10 Ballast factor: 88% minimum.

- .11 Capacitor: thermal protection, free of PCB.
- .12 Thermal protection: self-healing of the coil.
- .13 Efficiency greater than 84 Lum / Watt.
- .14 Electronic ballasts should be of Class 3. Accepted products: Philips (Advance series Centium), GE, ULT (HP series) or equivalent Osram (QT series).
- .4 Metal halide ballasts:
 - .1 Rated voltage: 60 Hz and as directed, designed for metal halide lamp, quartz burner circuit to reboot.
 - .2 Fully boxed and designed for use at an ambient temperature of 40 °C.
 - .3 Power factor: at least 95%, 95% of the nominal luminous lamps flux.
 - .4 Type: Constant wattage autotransformer, with isolated secondary winding or semiconductors.
 - .5 Capacitor: free of PCB.
 - .6 Supply voltage range: $\pm 5\%$ of rated voltage.
 - .7 Minimum temperature boot: -34 ° C, 90% of the rated supply voltage.
 - .8 Installation: inside, outside, remote, or integrated to luminaire, as indicated.
 - .9 Crest Factor: 1.7 or less.
 - .10 Accepted products: Advance, Philips, G.E., Osram.
- .5 High pressure sodium vapor ballasts: according to ANSI C82.4.
 - .1 Rated voltage: 60 Hz and as directed, designed for high pressure sodium vapor lamp.
 - .2 Fully boxed and designed for use at an ambient temperature of 40 ° C.
 - .3 Power factor: 95% minimum, 95% of the nominal luminous lamps flux.
 - .4 Type: inductive, capacitive, controlled magnetic semiconductor. Choose the appropriate boot device, recommended by the manufacturer.
 - .5 Capacitor: free of PCB.
 - .6 Supply voltage range: $\pm 10\%$ of rated voltage.

- .7 Minimum temperature of initiation: 40 ° C, 90% of the rated supply voltage.
 - .8 Installation: inside, outside, remote, or integrated to luminaire.
 - .9 Crest Factor: 1.7 or less.
 - .10 Accepted products: Philips, G.E., Advance or equivalent Osram.
- 2.4 FINISHES
- .1 The finish and construction of fixtures must be UL listed and CSA certified to be the type of installation planned.
 - .2 Unless otherwise indicated in the list of fixtures, box and reflectors must be 20 gauge cold-rolled steel. Metal surfaces of the box and the reflector should be covered with a layer of baked enamel finish free of pitting or defects.
 - .3 Baked powder coating polyester:
 - .1 Reflectors and metal surfaces of the housing must have a high gloss finish coating in polyester powder paint and with a smooth, uniform and free of pinholes or other imperfections.
 - .2 The finish reflectors and other interior surfaces shall be as follows:
 - .1 Color: white, with 85% reflectance.
 - .2 Color fastness: yellowness index of 0.02 at the origin, and not more than 0.05 after exposure for 250 hours in an accelerated aging device "Atlas Fade-Ometer."
 - .3 Thickness of the paint film: average of at least 0.03 mm, and at no point less than 0.025 mm.
 - .4 Gloss: at least 80 units, measures taken to 60° at gloss meter Gardner.
 - .5 Flexibility: the coating shall withstand a bend test around a mandrel 12 mm, and show no signs of cracking or flaking when viewed under a microscope at a magnification of about 10.
 - .6 Adherence: a grid of 24 mm square, a square of 3 mm side is marked by a sharp razor blade embedded in the paint film to the substrate metal, cellulose adhesive tape is then applied to the grid and then departed: adhesion is considered satisfactory if the paint coating is not taking off.
 - .4 Alzak finish:

- .1 Type of finish obtained on an aluminum sheet made from special alloys, high-gloss anodized and chemically in accordance with the requirements of Alcoa, in order to submit, as appropriate, the following characteristics:
 - .1 Type of finish designed for light commercial service: coating having a weight of at least 7.8 g/m²; reflectance of at least 83% in the case of specular surfaces, 80.5% in the case of semi specular surfaces and 75% in the case of diffuse surfaces;
 - .2 Type of finish designed for normal industrial service: coating having a weight of at least 14.8 g/m²; reflectance of at least 82% in the case of specular surfaces, and at least 73% for diffuse surfaces;
 - .3 Type of finish designed for heavy duty: coating having a weight of at least 21.8 g/m²; reflectance of at least 85% in the case of specular surfaces, and at least 65% in the case of diffuse surfaces.

- 2.5 OPTICAL CONTROL DEVICES
 - .1 The louvers and lenses of fluorescent fixtures must be constructed of non-combustible materials such as acrylic (polymer of styrene derivatives are not accepted).

- 2.6 SAFETY SHUT-OFF
 - .1 The fluorescent light fixtures that are powered at a voltage of 150 V or more must include:
 - .1 an isolating device integrated into the luminaire.
 - .2 a prominent and permanent identification, specifying the use of the isolating device, and the voltage rating of the luminaire.

- PART 3 – EXECUTION**
 - 3.1 INSTALLATION
 - .1 Mounting height as shown in the drawings or determined by the CDC representative on site.
 - .2 Install fixtures until all work that are likely to damage or soiling are completed. The Contractor shall obtain approval from the CDC representative prior to installation.
 - .3 The lighting location is determined according to the reflected ceiling plans. Plans should not be interpreted to scale. The exact location of lighting should be coordinated with the CDC representative.
 - .4 In the boiler, mechanical, refrigeration, ventilation, air and conditioning rooms, sub-stations and other places where there are pipes on the ceiling or ventilation ducts, install lights on rods of appropriate length so that the light beam is not obstructed by piping. No lighting shall be installed before the installation of all equipment and piping.

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| | .5 | Aluminum luminaires in direct contact with concrete must be coated with tar to contact points. Those installed outside must be "anodized aluminum" or stainless steel. |
| | .6 | In a continuous row of fluorescent fixtures, all fixtures in the same row must be the same type. The fluorescent fixtures boxes installed in continuous rows are held together by the two 8-32 bolts and nuts. |
| | .7 | Use all frames or hoops to cast even if not specifically requested in the list of luminaires. |
| | .8 | Install lighting fixtures and supports and / or poles as indicated. |
| | .1 | Fixtures must be adequately supported for the type of ceiling system in which they are mounted. |
| | .2 | Install monitoring equipment as indicated. |
| | .3 | Install exterior lights in accordance with the manufacturer's instructions. As indicated, and in the presence of CDC representative, in darkness, turn the lights on and fix them in a permanent position. |
| | .9 | Upon request of the CDC representative, before ordering lighting fixtures, the contractor shall supply and install on site a sample of each device and obtain approval from the CDC representative. |
| 3.2 | <u>WIRING</u> | .1 Connect luminaires to lighting circuits: |
| | .1 | Install flexible or rigid conduit for luminaires as indicated in Sections 26 05 34 – Conduits, conduit fastenings and conduit fittings and 26 05 21 – Wires and cables. |
| 3.3 | <u>LUMINAIRE SUPPORTS</u> | .1 The ceiling-mounted light fixtures must be supported independently of the backbone of the suspended ceiling as required by the local inspection agency. |
| | .2 | The fluorescent fixtures mounted light strips must be supported at intervals of 1.2 m. |
| 3.4 | <u>FLUORESCENT FIXTURES ANCHORS AND SUSPENSIONS</u> | .1 The fluorescent lights placed directly under the surface of concrete slabs are held with bolts envelope self-drilling of 13 mm. |
| | .2 | The fluorescent fixtures are suspended from ceilings using suspension rods. |
| | .3 | The spacing between the rods supports shall be as recommended by different manufacturers. |
| | .4 | On the plans, the outputs for lighting are shown in the center of the fixture for the purpose of drawing. It is understood that the output power must be located on top of a media fixture. |

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| | .5 | The fluorescent fixtures mounted light strips (butt) must be supported at intervals of 1.20 m. |
| | .6 | All fixtures installed at more than 4 m above the floor must be retained with a steel cable. |
| 3.5 <u>LUMINAIRE ALIGNMENT</u> | .1 | Luminaires mounted light strips must be properly aligned so as to form a continuous straight band. |
| | .2 | Individually mounted fixtures should be parallel or perpendicular to the lines of implantation of the building. |
| 3.6 <u>CLEANING</u> | .1 | Clean in accordance with Section 01 74 11 – Cleaning. |
| | .2 | Remove surplus materials, excess materials, rubbish, tools and equipment. |
| | .3 | Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/ Demolition Waste Management and Disposal. |
| 3.7 <u>TESTING</u> | .1 | Perform tests in accordance with Section 26 05 00 – General Requirements. |
| | .2 | Ensure good operation of all devices. |

END OF SECTION

PART 1 – GENERAL

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| 1.1 | <u>SECTION CONTENTS</u> | .1 | This section covers PVC and fibreglass conduits, polyethylene pipes used as underground electrical conduits, terminals, and their installation. |
| 1.2 | <u>RÉFÉRENCES</u> | .1 | Canadian Standards Association (CSA International). |
| 1.3 | <u>ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Provide submittals in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – General Requirements. |
| | | .2 | Product data: |
| | | .1 | Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations. |
| | | .2 | N/A |
| | | .3 | Quality Assurance Control: submit following in accordance with Section 01 45 00 – Quality Control. |
| | | .1 | Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties. |
| | | .2 | Manufacturer's instructions: when required, submit the manufacturer's instructions, including indications for specific methods of handling, implementation and cleaning. |
| 1.4 | <u>DELIVERY, STORAGE AND HANDLING</u> | .1 | Packaging, transportation, handling and unloading: |
| | | .1 | Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements. |
| | | .2 | Transport, store and handle materials and equipment in accordance with manufacturer's written instructions. |
| | | .2 | Packaging Waste Management: |
| | | .1 | Separate waste materials for reuse / recycling and reuse, in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal. |
| | | .2 | Do not burn wood that has been treated with a preservative. |
| | | .3 | Wood treated with a preservative must be separated from materials and equipment to be recycled or reused. Remove the ends, waste and sawdust from treated wood |

to a landfill proposed by the contractor, but approved by the department's representative.

- .4 Move unused wood preservation products to an approved hazardous materials collection site.
- .5 It is forbidden to pour unused preservatives in sewers, rivers, lakes, on the ground or at any other location where it may risk health or the environment.
- .6 Send the unused solvent cement to an approved hazardous materials collection site proposed by the contractor but approved by the department's representative.
- .7 It is forbidden to discharge unused solvent cement in sewers, rivers, lakes, on the ground or at any other location where it may risk health or the environment.

PART 2 – PRODUCTS

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| 2.1 | <u>SUSTAINABLE REQUIREMENTS</u> | .1 | N/A |
| | | .2 | N/A |
| 2.2 | <u>PVC DUCTS AND FITTINGS</u> | .1 | Rigid PVC conducts, DB2/ES2 type, flared ends with prefabricated and molded fittings, for direct burial, size as indicated. Note that it is forbidden to use PVC conduit in soils that may contain harmful substances (oils or solvents) or some polymers. Consult the manufacturer for other chemicals that could be harmful. Use fibreglass conducts or other suitable ducts types, when the soil contains such substances. |
| | | .2 | Rigid PVC fittings, opaque, flared fittings, solvent welded elbows, couplings, reducers, plugs, caps and adapters needed to complete installation. |
| | | .3 | Expansion joints according to manufacturer's recommendations and as indicated. |
| | | .4 | 90 degrees elbows and 45 degrees couplings with 5° angle, in rigid PVC, as required. |
| 2.3 | <u>ADHESIVE SOLVENT</u> | .1 | Solvent adhesive for the assembly of PVC tubing. |
| 2.4 | <u>FIBERGLASS DUCTS</u> | .1 | Thermoset ducts reinforced with fibreglass: AG or BG type, sealed, self-extinguishing, immersing and size as indicated. Note that the type AG can be used for both aboveground facilities to underground facilities. BG type is only suitable for underground installations. AG type has a higher compressive strength than the type BG. |
| | | .2 | All necessary couplings, reducers, plugs, caps, adapters and |

			brackets to complete installation.
		.3	Expansion joints according to manufacturer's recommendations and as indicated.
2.5	<u>POLYETHYLENE PIPE</u>	.1	Rigid polyethylene pipe, with couplings and fittings approved and required to complete installation, with water removal that may lie inside the ducts.
2.6	<u>CABLE PULLING EQUIPMENT</u>	.1	Nylon or polypropylene draw cord, stranded 6 mm, 5 kN tensile strength, single length in each duct, with more than 3 m in each end.
2.7	<u>MARKERS</u>	.1	As indicated, supply and install markers. If several types of markers are prescribed, indicate or specify the places where each type should be installed.
		.1	Work performed by Transport Canada: a copy of the standard markers is required.
		.2	Markers locating cables, concrete 600mm x 600mm x 100mm, with appropriate inscriptions "cable", "joint" or "conduit" engraved on the top, and arrows indicating a change of directions in the course of these feeders and/or ducts.
		.2	Cedar posts: 89 mm x 89 mm x 1.5m posts, pressure treated with a water repellent preservative consisting of a transparent solution of copper naphthenate or pentachlorophenol at 5%, with a nameplate attached near the top of the post, side pipe.
		.1	Nameplate: anodized aluminum, 89 mm x 125 mm and 1.5 mm thick, to attach to the cedar post, covered with a Mylar label 0125 mm range, as appropriate, the inscriptions "cable ", " junction" or "conduit ", and arrows indicating the direction changes.

PART 3 – EXECUTION

3.1	<u>MANUFACTURER'S INSTRUCTIONS</u>	.1	Compliance: comply with the requirements, recommendations and manufacturer's written specifications, including all technical bulletin available, instructions on handling, storage and installation of products, and technical information sheets.
3.2	<u>INSTALLATION</u>	.1	Group underground conduits or pipes as indicated and in accordance with the manufacturer's requirements.
		.2	Install groups of pipes on a 150mm thick layer of sand compacted to 95% of Proctor maximum dry density.
		.3	Dig the trench across the whole distance between two points before your start laying pipes and make sure no obstructions is

present that could cause a change in the level of the conduits.

- .4 In case of sustainable soils (clay), pour a 75mm thick concrete slab at the bottom of the trench before placing conduits.
- .5 Install conduits levelled and/or sloped as indicated, giving them a minimum slope of 1:400.
- .6 Maintain conduits spacing as indicated.
 - .1 To ensure required vertical separation where ducts are installed in several horizontal layers superimposed, install plastic pipes spacers so that they are securely supported at 15 m intervals and that all transitions are progressive over the entire length of the ducts.
- .7 Proceed to transpositions, deviations and changes of direction using 5 degrees elbows; the total deviation should not exceed 20 degrees.
- .8 Use conduits adapters to connect non-metallic conduits to steel conduits.
- .9 Terminate the very end of each pipe network by a connection cap flush with the end (wall and/or floor), in anticipation of a possible extension.
- .10 When cutting, boring and facing the end of the conduits during construction, obtain the Engineer's authorization and follow the manufacturer's recommendations so that the ends are identical to factory-prepared ends.
- .11 Clean the inside of the conduits before installation. Plug the ends with PVC caps to prevent foreign matter from entering, during and after installation.
- .12 Immediately after installation, run a 300mm long and 6mm smaller than the inside diameter of the conduit wood chuck, followed by a stiff bristle brush to remove sand, dirt or other foreign material. Brush with a stiff bristle brush in each conduit immediately before cable pulling.
- .13 In each pipe, install a single length cord, full length of the conduit and 3m beyond the two ends of the conduit.
- .14 Before backfilling the trench, place the continuous warning tape.
- .15 Install markers as required.

3.3 MARKER LOCATION

- .1 Install concrete tracking marker above the ends of these groups of conduits. Install these markers flush with the finished ground level.
- .2 Install markers at 50mm intervals along the straight conduits groups and at each change of direction.
- .3 When necessary to remove the tracking markers for other work,

reinstall the markers once the work is completed.

.4 Lay concrete tracking markers flat and 25mm above the finished ground surface, while centered over the conduits.

.5 Provide drawings showing the location of the tracking markers.

3.4 CLEANING

.1 Perform cleanup in accordance with Section 01 74 11 – Cleaning.

.2 Remove excess construction material and equipment, waste, tools and equipment once the installation work and performance monitoring are completed.

.1 Separate waste materials for recycling in accordance with Sections 01 74 21 – Construction/Demolition Waste Management and Disposal.

3.5 INSPECTIONS

.1 Once the installation of direct buried underground cable ducts is completed, and before backfilling trenches, notify the department's representative to inspect on-site installation, for work acceptance.

END OF SECTION