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CANADIAN SPACE AGENCY
COLLABORATION AREAS

Specifications – Electrical

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CANADIAN SPACE AGENCY

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COLLABORATIONS AREAS

DIVISIONS 20, 26, 27, AND 28

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Part 1 General

1.1 DEFINITION

.1 The terms "Contractor", "General Contractor" and "Supervisor" refer to the person or entity designated as in contract with the Owner or Manager of the works.

.2 The expressions "section", "sections", "each section", "each related section", "performed by section" and "supplied by section" refers to the firm responsible for the work of that section.

.3 The terms "Engineer" and "Engineers" mean the firm or the Designated Representative of the engineering firm that issued the engineering section, specifications or plans related to the work covered by these documents.

1.2 EXAMINATION OF THE SITES

.1 See general and specific conditions of the contract.

1.3 VERIFICATION OF THE DRAWINGS AND SPECIFICATIONS

.1 Only drawings and specifications marked "for tender" should be used for the calculation of bids.

.2 Check that the copy of the documents is complete: number of drawings, specifications' number of pages.

.3 Specialties mentioned in the titles of the drawings are to facilitate the work of each section and should not be regarded as restrictive.

.4 Drawings indicate the approximate placements of equipment. Each section must check the exact emplacements before any installation.

.5 During bids, each section must study the mechanical and electrical drawings and specifications and compare them with Architectural and structural drawings and specifications and notify the Architect or Engineer at least five working days before submission of his tender of any contradictions, errors or omissions that can be observed.

.6 During the execution of the works, notify the Architect or Engineer of any inconsistency, error or omission discovered before starting the work.

.7 The Engineer reserves the right to interpret the contents of mechanical and electrical drawings and specifications.

.8 No indemnity or compensation will be given for the displacement of ducts, pipes, etc., deemed necessary because of the Architecture, the structure or any other normal consideration.

1.4 PRODUCTS USED FOR TENDERS AND EQUIVALENCY

.1 Each section must prepare an overall price for a tender based only on the products described in the drawings and specifications. The person preparing the tender must not assume that the manufacturers' materials and equipment whose names appear on the "MANUFACTURER LIST" are automatically equivalent. Each section is solely responsible for the verification and validation of equivalence (and, where appropriate, of the special manufacturing requirements for it) of the product that will need to be used from a manufacturer on the list.

.2 Where an asterisk (*) is used in the manufacturer list at the request of the Customer, the relevant section must bid with the product from that manufacturer.

.3 All modifications required by the usage of an equivalent material or device to that specified is to be performed at the cost of the division supplying the device, even if it applies to other specialties and if implications are discovered after the acceptance of the substitution request.

1.5 SUBSTITUTION OF MATERIALS

.1 Equipment and materials from manufacturers other than those mentioned in the manufacturer list may be substituted only after the presenting the tender, provided that they are approved according to the following procedure:

.1 Equivalency requests must be made by the relevant section only. They must be submitted within a maximum of fifteen business days following the signing of the contract. They must be accompanied by the following documents:

.1 Original tender for the specified products.

.2 Tender received for products to be substituted.

.3 Justification of the request.

.4 Proofs of equivalency.

.2 The submission of equivalency requests to periods other than that mentioned above will only be considered for reasons truly exceptional and extraordinary.

.2 The main points of comparison are construction, performance, capacity, dimensions, weight, encumbrance, technical specifications, parts' availability, maintenance, delivery delays, the evidence of tried and true equipment in service and impact on other specialties.

.3 Any changes caused by the use of an equivalent equipment or material is to the cost of the section that provided the equipment, even when it applies to other specialties, and even if the implications are made apparent after the substitution request is accepted.

.4 Any request for substitution will be rejected if it were to impede or delay the execution of the works.

1.6 QUEBEC TENDER OFFICE (BDSQ)

.1 Each section whose work falls under the jurisdiction of the Submission Code of the Quebec Tender Office must submit a copy of their tender to the Engineer at the same time as their submission to the electronic submission system (TES) of the BDSQ.

1.7 IMPORTANT NOTE: SUPPLY AND INSTALL

.1 Supply and install all materials and equipment described in this specification and/or shown in the drawings, whether the term "supply and install" is used or not. See also the article "MINOR WORKS".

1.8 LAWS, REGULATIONS AND PERMITS

.1 All laws and regulations issued by the authorities having jurisdiction relating to the works described herein apply. Each section is required to comply with them without additional compensation.

.2 Each section must obtain, at its expense, all necessary permits and certificates, pay all costs for drawing approvals and for inspections required by organisations having jurisdiction.

.3 Submit to the Engineer a copy of the drawings bearing the seal of approval of the relevant inspection services.

.4 Upon completion of the works, obtain and submit to the Owner, complete with a copy of the mailing slip for the package sent to the Engineer, all permits, approval certificates, and other obtained from the different offices and departments that have jurisdiction over this building.

.5 Restrictions regarding tobacco usage:

.1 It is prohibited to smoke inside the building. Comply with restrictions applying to tobacco usage on the building property.

.6 Discovery of dangerous materials:

.1 If materials applied by spray or trowel, likely to contain asbestos, polychlorinated biphenyls (PCBs), moulds or other designated hazardous materials are discovered during demolition, immediately stop work.

.1 Take corrective action and immediately notify the Owner.

.2 Do not restart work until written instruction is received.

1.9 TAXES

.1 Pay all taxes required by law, including federal, provincial and municipal.

1.10 MINOR WORKS

.1 Each section is required to provide all the required components and to do all the jobs which, although not specified in the estimate, are necessary for the operation of the equipment and to complete the work included in his contract.

1.11 TOOLS AND SCAFFOLDING

.1 On the worksite, provide the full range of tools required for the proper execution of the work. Also supply, erect, and remove the scaffolding required to perform the work.

1.12 COOPERATION WITH OTHER TRADES

.1 Each section must:

.1 Cooperate with other trades working in the same building or on the same project.

.2 Keep itself informed of additional drawings issued to these other trades.

.3 Ensure that these drawings do not come in conflict with its work.

.4 Organize its work so as not to interfere in any way with other work done in the building.

.5 Collaborate with the other sections to determine the location of accesses in walls and ceilings.

.2 During the work, if necessary, the relevant section must remove and replace the tiles or access doors to reach its equipment and repair, at its own expense, all the damage it has caused. Protect the furniture and return the premises to a clean condition when the work is completed.

1.13 SCHEDULING OF OPERATIONS

.1 Plan and execute work in such a way as to minimally disturb the normal use of the building.

.2 During the tender process of the contract, present a schedule for the work in the form of a bar graph (Gantt diagram), specifying the expected steps in the work until completion, including the project milestones. Once the schedule is reviewed and approved, take necessary action to ensure the project progresses on schedule. Do not modify the calendar without consulting the Engineer and the Owner.

.3 Perform work during "normal work hours". See Architect's specification and Owner’s instructions.

.4 Work in occupied areas must be performed outside of normal work hours. See Architect's specification and Owner’s instructions.

.5 Perform the following work during periods of inoccupation. See Architect's specification and Owner’s instructions.

.6 Notify the Engineer and the Owner 48 h before performing work during periods of inoccupation.

1.14 MATERIALS

.1 Unless otherwise indicated, use new materials clear of imperfections or defects, in the required quality, bearing the approval labels CSA, ULC, FM, AMCA, ARI and other according to the specialties.

1.15 PROTECTION OF WORKS AND MATERIALS

.1 Each section must protect its installations against all damage, from any cause, during the execution of works until the work is accepted in a definitive manner.

.2 All equipment and materials stored on-site must be adequately protected, sheltered from bad weather, or any other possible damage.

.3 At the end of each workday, seal with a screw cap or a suitable metal cap all openings in conduits of any kind.

1.16 SHOP DRAWINGS

.1 Before fabrication or order of any component, submit a PDF copy by email for approval. Each drawing or data sheet should be submitted as a distinct PDF file. The PDF name should include the section, article and name of the article title in the specifications (example: 00_00_00_0.00_Equipment XYZ.pdf).

.2 Drawings must include the dimensions, weight, number of attachment points, centre of gravity, seismic requirements, wiring schematics, capacities, controls schematics, curves, space requirements for maintenance and operation, and all other relevant information. If present, clearly indicate the location and dimensions of plumbing, heating, cooling, electrical, etc., connections by device. Each drawing must be verified, coordinated, signed, and dated by the relevant section before being submitted for approval.

.3 All correspondence and/or document submitted via project management software by the Contractor or a Sub Contractor will not be reviewed and will be not be considered as submitted/received.

.4 Shop drawings must be relevant to the proposed equipment. The sheets from general catalogs are not accepted as shop drawings. Each drawing must be preceded by a title page indicating with the name of the project, the consultant's name, the date and identification tag of the equipment shown in the drawings and specifications. The title page must also include the revision number of the documents as well as the expected delivery date of the product. Drawings must be prepared and signed by the supplier. Drawings pulled from the supplier’s website are not accepted.

.5 The verification of shop drawings is general and has the main purpose of avoiding as many errors as possible in manufacturing. This verification does not relieve the relevant section of its liability for errors, omissions, information, dimensions, quantity of equipment, etc., appearing in their drawings.

.6 Drawings for non-catalogued items must be specifically prepared for the project.

.7 The verification of the shop drawings by the Engineers does not diminish the responsibility of the supplier to ensure that the equipment meets all applicable codes and standards, as well as the requirements in this specification.

.8 When shop drawings are resubmitted or installed, inform the Engineer in writing of changes made, other than those requested by the Engineer.

.9 When equipment is manufactured before the verification of the shop drawings by the Engineer, the Engineer may refuse the equipment. The Contractor is responsible for any costs associated with the refusal.

.10 The drawings must be in French.

1.17 COORDINATION DRAWINGS

.1 General:

.1 Coordination drawings, also called composite drawing, are required in all cases where interference between different trades' works need such drawings to illustrate that the work is realizable.

.2 Coordination drawings must show clearly and precisely all the work involved, those of the relevant section and those done by others.

.3 Communicate with the Architect to procure Architectural base plans.

.2 Description:

.1 Coordination drawings consist of dimensioned plans, to scale, indicating the position of the equipment, ducts, piping, valves and other accessories with cuts and details required, complete with piping and duct dimensions, locations of sleeves, openings, anchorages and supports, relative positions with structure, architectural works, mechanical and electrical work, the positioning of the access doors, the clearances required for the maintenance of equipment and all other disciplines.

.2 Each mechanical and electrical section must provide on their coordination drawings the details of their levelling bases and housekeeping pads.

.3 Preparation:

.1 Each relevant section must make their coordination drawings and coordinate them with other disciplines.

.2 All drawings must be coordinated by the Contractor in collaboration with all sections.

.3 The coordination drawings for each sector must be submitted all at once for verification.

.4 The section "VENTILATION – AIR-CONDITIONING" is responsible for coordinating drawings with each section. These sections must provide all the data, diagrams, drawings and diagrams necessary for this coordination work.

.4 Collaboration:

.1 Close collaboration must exist between the sections in order to determine the location of their respective work and avoid incompatibilities.

.5 Distribution of coordination drawings:

.1 Before submitting the drawings to the Engineer for verification, the general Contractor and each of the sections must sign the plans.

.2 Submit to the Engineer two paper copies and one emailed digital PDF copy of the scaled coordination drawings signed by the General and Sub Contractors for verification.

.3 All correspondence and/or document submitted via project management software by the Contractor or a Sub-Contractor will not be reviewed and will be not be considered as submitted/received.

.4 Once commented on, the drawings will be corrected by the relevant section, and, if required, resubmitted.

.6 Responsibility:

.1 Each section is directly responsible for the placement and exact dimensions of openings, perforations and sleeves, the location of its equipment, pipes and ducts, whether the structural, Architectural or Engineering drawings are included or not.

.2 The Division 23 (section "VENTILATION – AIR-CONDITIONING") must ensure the full coordination of its work with the coordination drawings.

.3 No compensation will be given for the modifications of the work for the purpose of coordination and integration of the electromechanical systems.

.4 Notwithstanding the responsibility of coordinating the integration, work cannot be implemented without prior verification of the coordination drawings. Each section must redo, at its expense, all work nonconforming to the coordination drawings without any compensation based on a misinterpretation of the scope and limitations of its work. Such misinterpretations do not relieve the relevant section of its responsibilities and obligations to provide complete and duly proven, ready to operate systems in fully integrated and in perfect condition.

.5 Verification of the coordination drawings by the Engineer serves to ensure that the technical requirements appear to be generally met. The Engineer does not check the quality of the coordination carried out by the Contractors.

.7 Pre-existing work:

.1 Coordination drawings should account for existing mechanical, electrical, structural and Architectural installations as well as planned work.

.8 Coordination drawings are required for:

.1 Anchors.

.2 Work on the fire sprinkler and fire prevention.

.3 All ventilation work – air conditioning.

.4 All mechanical and electrical work in all places where space is particularly restricted.

.5 Work performed by a section that could have implications on the work of another section.

.6 Places described in sections of the Divisions 21, 23, 25, and 26.

.7 This clause is not restrictive. Coordination drawings may be demanded for places deemed necessary.

.8 For all work on automatic sprinklers, the coordination drawings are the responsibility of the Division 21.

.9 Original coordination drawings:

.1 At the end of the work a USB flash drive (containing the DWG) including each O&M manual and a secure electronic transmission of the as-builts are to be submitted to the Owner, for no additional charge, by each section. Also applicable when transmitting as-built by the contractor.

1.18 USING DIGITAL MODELS FOR COORIDNATION

.1 DWG plans:

.1 Where approved by the Owner Representative, the Engineer may provide to the Contractor the digital DWG plans which were used to produce contractual documents.

.2 The Contractor must respect the "RESPONSIBILITY WAIVER – DWG PLANS" form included at the end of this section, understanding the limitations of using the digital plans, and complete and sign the form. Submit the duly completed form to the Engineer.

.3 The Engineer reserves the right to not provide the design files to the Contractor and/or related sections.

.4 The Engineer reserves the right to claim fees for the conversion of design files and specifications issued "for tender" to the format or edition requested by the Contractor and/or related section.

1.19 TECHNICAL REQUESTS FOR INFORMATION

.1 The Contractor must submit all requests for information (RFIs) by email.

.2 All correspondence and/or document submitted via project management software by the Contractor or a Sub Contractor will not be reviewed and will be not be considered as submitted/received.

.3 Technical Requests for Information:

.1 Each question must be submitted using a standardized RFI form.

.2 Each PDF RFI form may include only one question.

.3 Each question must be assigned a sequential number to facilitate tracking.

.4 The Contractor is responsible to review questions submitted by other sections to ensure that answers are not present in the contractual documents or previously provided, and to track progress of the RFIs to ensure work is not delayed.

.5 The RFI form must include, at minimum:

.1 Submission date of the question.

.2 Name of the sender and recipient.

.3 Subject line.

.4 Clearly formulated question.

.5 Clips of the plans, specifications and photos relating to the question.

.6 Proposed solutions.

.7 Sufficient space for the engineer to respond to the question on the form.

1.20 FRAMES AND ACCESS DOORS

.1 Unless otherwise specified, recessed frames and access doors in walls and ceilings, other than easily removable ceilings, shall be provided by the relevant section but installed by the company responsible for the construction of walls and ceilings.

.2 Each mechanical and electrical section shall determine the size and location of doors in such a way as to ensure easy access to all baffles, control devices, fire dampers, valves, vents, cleanouts, siphons, sieves, traps, ventilation units, pull boxes, electrical appliances, etc.

.3 The doors must be at the same fire resistance specified for the walls and ceilings.

.4 These frames and doors shall be built-in, constructed of 1.6129 mm (16-gauge) galvanized sheet metal with a layer of sealant. Hidden frames with exposed line with face flush with wall or ceiling, concealed hinge, 150° opening with lock and key (except on fire doors). The door must self-closing.

.5 The types of frames and doors are as follows:

.1 Walls made of brick, concrete block, finished in tile, poured cement blocks covered with gypsum boards or other similar finish: Karp no DSC-214M.

.2 Ceilings and walls of plaster or with cement finish or other similar finish: Karp KDW.

.3 Firewalls: Karp no KRP150FR, in steel, 16-gauge, with 50 mm (2") of insulation in the door, fire resistance of ULC 1½ h, with self-closing mechanism and without lock/latch.

.6 All Contractors must coordinate in order to provide the same type of door for all mechanical and electrical sections.

1.21 UP TO DATE DRAWINGS

.1 Each section must, at its expense, clearly indicate all changes, additions, etc., on a separate copy of the drawings and specifications, so as to have a complete and accurate copy of the work as executed and materials installed when the contract is completed. In particular, any displacement, even minor, of underground piping must be indicated with precision

.2 This copy of the drawings must be kept up to date and be available on site.

.3 Deliver these plans to the Owner at the end of the works

1.22 OPERATION AND EQUIPMENT MAINTENANCE INSTRUCTION MANUALS

.1 Each section must provide the Owner with four copies of manuals with detailed instructions for the operation and maintenance of all equipment and appliances included in his contract. Also provide a USB flash drive.

.2 These manuals must contain:

.1 A copy of the approved shop drawings, and as executed.

.2 A diagram of the controls with explanatory text.

.3 A list identifying access points to fire shutters and controls in the walls and ceilings.

.4 A list of legends of the piping, the piping identification codes, and ventilation systems.

.5 A list of the systems' final calibration values, as approved.

.6 A list of the different sub-Contractors with names, addresses, and phone numbers.

.7 A list of representatives and/or manufacturers of the installed equipment with names, addresses, and phone numbers.

.8 These instructions must contain all the graphics, curves, capacities and other data provided by the manufacturers concerning the operation and details of all mechanical and electrical equipment installed in the building.

.3 The entirety must be written in French.

.4 Submit one PDF copy to the Engineer for comment. Once approved, provide three (3) copies of the manual to the Owner and one to the Engineer.

.5 These manuals should be submitted before final trials. Provide an empty section to later add calibration and commissioning reports.

1.23 CONCEALED WORK

.1 Do not conceal any work, material, such as pipes, boxes, etc. before the installation has been verified.

.2 If a section does not comply with this requirement, it will have to pay the cost of all work required to proceed to the examination of the works.

.3 Unless otherwise indicated, all piping and ducts must be concealed in partitions, walls, between floors, in ceilings, etc. The cost of all necessary leveling shall be borne by the Contractor.

.4 Reread the articles "COOPERATION WITH OTHER TRADES" and "TESTING".

1.24 PLACEMENT OF PIPING AND DUCTS

.1 No pipe may be in contact with another. Allow a clearance of at least 15 mm (½") between them. No piping may be in contact with any part of the building. Take special care in the case of piping through a steel beam.

.2 Any piping or ducting that may possibly be covered by insulation must be installed at a sufficient distance from walls, ceilings, columns or other piping, ducts, and equipment to facilitate the insulation of the pipe or duct.

.3 Any piping or ducting placed horizontally must be installed to maximize the headroom of the area. This is of particular importance in rooms where ceilings are suspended, such as in parking lots and warehouses.

.4 Before installing a pipe or duct, make note of the location of the other mechanical, electrical, architectural and structural work to avoid interference, otherwise the relevant section will be required to move the pipe or duct at its expense.

1.25 MANUFACTURERS' INSTRUCTIONS

.1 Install the various pieces of prefabricated materials and equipment, in accordance with the manufacturer's instructions. Obtain all relevant instructions.

.2 Installation of equipment:

.1 Ensure that maintenance and disassembly can be done without having to move the connecting elements of the piping and ducts, by the use of union fittings, flanges or valves, and without the building structural members or other installations being obstacles. Dismantling must be possible without emptying networks and/or stopping the power supply to other equipment.

.2 The manufacturer plates and the seals or labels of the equipment standards and approvals organizations must be visible and legible once the equipment is installed.

1.26 LAYOUT AND ACCESS TO THE EQUIPMENT

.1 Install the equipment so that they are easily accessible for maintenance, disassembly, repair, and moving.

.2 Pay particular attention to the motors, belts, bushings, heat exchangers and boiler tubes, fittings, valves, controls, rotating shafts, etc.

.3 Installation of equipment:

.1 Ensure that maintenance and disassembly can be done without having to move the connecting elements of the piping and ducts, by the use of union fittings, flanges or valves, and without the building structural members or other installations being obstacles. Dismantling must be possible without emptying networks and/or stopping the power supply to other equipment.

.2 The manufacturer plates and the seals or labels of the equipment standards and approvals organizations must be visible and legible once the equipment is installed.

.3 Provide fasteners and metal accessories of the same texture, colour and finish as the support metal to which they are attached. Use non-corrosive fasteners, anchors, and shims to secure the external and internal work.

.4 Ensure that the floors or tiles on which the equipment will be installed are level.

.5 Check fittings done at the factory and retighten them if necessary to ensure the integrity of the installation.

.6 Provide a means to lubricate the equipment, including Lifetime lubricated shaft housings.

.7 Connect the equipment's drainage piping to the drains.

1.27 PAINTING

.1 Apply a base coat of sealant on any non-galvanized metal equipment or equipment supports. Before leaving the premises, touch up the base coat of all the damaged areas after removing any rust.

.2 Ensure that access doors of all kinds, including the opening convector panels, electrical panels, etc., are painted in the open position to ensure freedom of movement.

.3 See section 23 05 53.01 – Identification of systems and mechanical equipment.

1.28 NEW OPENINGS, DRILLING IN WALLS, FLOORS, BEAMS, AND COLUMNS

.1 General:

.1 Unless otherwise indicated, all necessary openings for piping and ventilation and electrical conduits in the form of holes to be made are the responsibility of the General Contractor, including all direct and indirect costs, such as tracking and marking.

.2 The General Contractor is responsible for all damages and repair caused by the openings.

.3 The openings must be sufficiently large to permit the laying of sleeves and thermal and acoustic insulation.

.2 When openings are required in rooms with sensitive equipment (example: server rooms), take all the necessary means to protect the equipment in operation during the penetrations (source capture, additional protections, etc.).

.3 Openings in concrete block walls and drywall:

.1 Sealing of openings by the Contractor.

.2 All new openings of 150 mm (6") and less are the responsibility of the section concerned, under the instructions of the structural Engineer.

.3 All new openings over 150 mm (6") must be made by the General Contractor, at his expense, under the directives of the Structural Engineer and the Architect.

.4 Firestop and smoke stop assemblies: in accordance with CAN/ULC S115-05 Standard Method of Testing Fire Performance of Firestop Assemblies. Install firestops and smokestops around pipes, ducts, cables and other objects penetrating firewalls to provide fire resistance equal to that of surrounding floors, ceilings and walls.

1.29 SUPERVISOR

.1 Each section must retain and pay for the services of a competent and permanent supervisor or superintendent who must remain on site until the works are accepted and having full authority to represent the section. All communications, orders, etc. supplied by the Engineer or Contractor are considered as given directly to the company responsible for the work of the section.

.2 Submit for approval the name, qualifications, and experience of the supervisor or superintendent. Following revisions made at the request by the Owner's representative, a lack of experience and qualifications relevant to the project will result in the mandatory replacement of the Superintendent by one meeting the requirements.

.3 This supervisor cannot be removed from the work site without a valid reason and prior written approval.

.4 Facilitate site inspections for the Owner and the Engineer at any time. During these visits, the supervisor must be available to them.

1.30 INSPECTIONS

.1 It is absolutely necessary before any inspection request to the Engineer, that the testing was previously conducted and successful.

1.31 TESTING

.1 Each section must cooperate with the other sections, so as to enable them to complete their tests within the time period allowed by the Contractor.

.2 Once the test is finished, readjust all the equipment used for this test, to permit their proper operation.

.3 General requirements:

.1 The Engineer may assist, at any time, in any test they deem necessary.

.2 All tests must be performed to the satisfaction of the Engineer.

.3 The Engineer may require a test of installations and equipment before accepting them.

.4 Give a written 48 h notice to the Engineer before the date of the test.

.5 If a piece of equipment or device does not meet the manufacturer's data or the specified performance during a test, immediately replace the defective unit or part and pay all expenses incurred by the replacement. Make adjustments to the system to achieve the desired performance. Cover all costs, including those of new tests and repair.

.6 Prevent dust, dirt, and other foreign matter from entering the openings of installations and equipment during testing.

.7 Submit the written test results to the Engineer.

.8 The tests must be performed and accepted prior to the installation of the thermal insulation.

.9 Do not conceal or embedded any piping, conduits, accessories or equipment before the tests are completed and accepted.

.10 By submitting the pipe or conduits to the test pressures required in each of the respective sections, take the necessary precautions to prevent the deterioration of equipment and accessories that cannot withstand such pressures.

.11 If it is impossible to test the entire installation in a single trial, it can be divided into several zones, each of which will be tested individually. The installation must be tested in several stages.

.12 Correct any leak detected. The defective part must be removed, repaired and the test is redone until the results are satisfactory.

1.32 "EARLY ACCEPTANCE", "WITH RESERVATION" AND "WITHOUT RESERVATION"

.1 Refer to general conditions and additional general conditions of the Architect or Client for the definition of "early acceptance", "with reservation " and "without reservation".

1.33 FINAL TESTING

.1 Each section must include all costs of final testing to the overall price in its tender. When the work is fully completed and settings, calibrations, and preliminary tests are successfully performed, run the final tests. Notify the Departmental Representative early enough to allow him to attend any of the tests judged necessary.

.2 In order to demonstrate that the work is complete and executed satisfactorily, each piece of equipment must run for a minimum period of fifteen days and that, prior to acceptance "with reservation". During this period, all equipment must operate simultaneously and not consecutively. The operation must be in automatic mode and set on controls as planned in the operating sequences.

.3 During this period, and until receipt "with reservation", each section concerned shall carry out normal maintenance, in accordance with the manufacturers' recommendations and the instruction manuals supplied by the Contractor. Maintenance between "qualified" and "unqualified" receptions will be performed by the Owner if all information is provided and training has been completed. Otherwise, the Contractor will have to assume the maintenance.

1.34 WARRANTY

.1 Each section guarantees its work for a period of one year after acceptance "with reservation" of the work by the Owner. It is required to repair or replace, at its expense, any defects that would become apparent during this period and that, within 48 h after having been formally notified.

.2 Manufacturers must offer a one (1) year warranty from the starting operation date or eighteen (18) months from the date of delivery to the site, as appropriate. The warranty must include the cost of materials and labour, and the replacement of defective parts and/or manufacturing defect. In the case of chillers, a five-year warranty applies if the refrigerant charge is contaminated due to the compressor motor burning.

.3 The warranty is for a period greater than one (1) year (extended/or special warranties), for the areas indicated in the respective specifications.

.4 This warranty is fully independent of the article of the Civil Code concerning the five (5) year warranty.

.5 General conditions:

.1 It is expected that several contracts of the same discipline may be executed by different companies, that another company may have adjustments or tests to be executed on its work, that another company may have work to be done which are a subsequent phase of its work, that each company is committed, through this specification, to accept that its work is subject to all conditions listed above without changing the terms of the warranty.

.6 The use of permanent equipment for temporary purposes does not relieve the relevant section of its responsibilities and obligations with respect to the acceptance and guarantee of its work.

.7 The Engineer and/or the Owner reserve the right start the equipment and mechanical and electrical works without affecting the section's obligation to see to the full maintenance of its work up to acceptance "with reservation".

1.35 OBLIGATIONS DURING THE WARRANTY PERIOD

.1 During the warranty period, in addition to the obligations described in the specifications, the relevant section must provide any technical assistance required by the Engineer and/or Owner with respect to the operation of the installations and their improvements or adjustments as required.

.2 The temporary use or testing with the goal of adjusting equipment or any other purpose, or permanent use by the Owner of the mechanical and electrical works before the final acceptance of the works should not be interpreted as evidence that such works are accepted by the Owner and does not alter the terms of the warranty. During this time period, the relevant section retains responsibility for the maintenance of installation. No claim for damage or failure of any part of the work put into use will be considered by the Owner.

1.36 RENOVATIONS

.1 Continuous service:

.1 The following services are not to be interrupted without prior agreement with the Owner: telephone, electricity, lighting, intercom, fire alarms, sprinklers, fire protection water, aqueduct water, domestic water, sanitary plumbing, storm drainage, external drainage systems, ventilation – air-conditioning, etc.

.2 To ensure the continuity of services at during the hours required by the Owner, each relevant section must do all temporary works required, including labour and equipment.

.3 All major service cuts must be performed outside the occupancy hours of the building. For example: electricity, water, steam, telecommunications services, etc.

.2 Demolition:

.1 All demolition work is the responsibility of each concerned mechanical and electrical section.

.3 Occupied rooms:

.1 The work is being done during the occupancy of rooms in the building, therefore, the work must be performed by stages in the rooms designated by the Owner.

.2 Perform work after prior agreement with the Owner and establish an acceptable work schedule with the Owner.

.3 Before undertaking work in a given area, ensure the availability of all equipment, tools, and labour required to perform the work without interruption.

.4 Follow the Owner's instructions as to the delivery to the worksite of its personnel and equipment.

.5 The Owner will indicate which staircase can be used and within what limits it is permitted to circulate in the present corridors.

.6 Take all necessary precautions to adequately protect existing installations in these areas.

.7 At no time must the traffic and the functioning of the building services be impeded. Follow all of the Owner's instructions.

.4 Noise:

.1 Because of the proximity of the occupied premises, take all necessary measures to reduce the noise from construction and demolition.

.5 Dismantling of existing piping, materials, and equipment. Unless otherwise instructed:

.1 Any removed pipe, fitting, or valve should not be reused.

.2 No device should be reused.

.3 The dismantling of pipes, materials and existing equipment is the responsibility of each concerned mechanical and electrical section unless indicated otherwise.

.4 All existing equipment and material removed and not re-used or not returned to the Owner, as described below, belong to the respective mechanical or electrical section who are to dispose of them as quickly as possible off site.

.5 Every concerned mechanical and electrical section must anticipate the cost of transporting waste off site and bear all related costs to dispose of it.

.6 Piping insulated with asbestos:

.1 Workers holding the required qualifications must perform work involving the removal of asbestos-containing insulation. In situations where asbestos-containing insulation is discovered on catalogues or non-catalogues piping, the Contractor or the related section must refer to the general clauses of the contract and immediately inform the Project Manager and/or the Owner's representative.

1.37 CERTIFICATION OF COMPLIANCE

.1 At the end of the work, each section must submit to the Engineer a certification of compliance stating that all work was performed following the drawings and specifications, and all applicable standards and codes. Refer to example form at the end of this section.

.2 Submit the certificate to the Engineer at the same time as the request for an attestation of successful work completion.

.3 Have an administrator from the company sign this form and affix their seal to it.

1.38 CLEANLINESS OF THE SYSTEMS

.1 Take every necessary measure and precaution to keep the inside of all of the ventilation systems' components and ducts clean. Otherwise, duct cleaning and sample analysis may be required at the Contractor's expense to ensure that the dust level does not exceed 0.75 mg/100 cm² in order to comply with the NADCA-ACR standards.

.2 Duct cleanliness:

.1 See section 23 05 00 – CVCA – Common work results for HVAC.

1.39 CLEANING

.1 Clean the work area as work progresses. At the end of each workday, or more often if the Owner sees fit, remove the trash, carefully arrange the equipment to be used, and do the work site cleanup.

.2 Once the work is completed, remove the scaffolding, temporary protective equipment, and surplus materials. Repair any defects observed at this stage.

.3 Clean the areas used for the execution of works and put them in a state at least equivalent to that which existed before the work began, the cleaning must be approved by the Owner.

1.40 SECURITY SCREENING

.1 All personnel involved in the execution of the work will be subjected to a security screening. Obtain the required authorisations, as per the requirements, for all personnel who are to be present on site.

.2 Personnel will be screened every day the beginning of the workday, where they will be provided with a security pass they must carry on their person at all times, to be returned to security at the end of the day.

1.41 BREAKDOWN OF COSTS

.1 Before submitting a request for first payment, provide a detailed breakdown of costs relative to the contract, indicating also the overall price of the contract, as per the Engineer's instructions. Once approved by the Engineer, the breakdown will serve as a reference for payment installment calculations.

.2 Where applicable, include the following lines, as well as the related amounts, in the monthly statements of each of the specialized Contractors:

.1 Mobilization.

.2 Insurance and surety bonds.

.3 Erection drawings.

.4 Hydraulic calculations for fire protection.

.5 One line per activity per sector, floor or phase.
.6 Tests and trials.
.7 Preliminary balancing reports (aeraulics and hydraulics).
.8 Final balancing report.
.9 Seismic measurement compliance report.
.10 Demobilization.
.11 Operation and maintenance manual.

Part 2 Product

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

COMPLIANCE CERTIFICATE

Project: _____

Project address: _____

Discipline: _____

Specification section: _____

We certify that all materials and equipment used, as well as all apparent or concealed work that we have completed or that we have ordered completed, are in all aspects, compliant with the plans, specification, addenda, and changes prepared by the Engineers of Bouthillette Parizeau Inc., and with all applicable codes, laws and regulations in effect.

Company name: _____

Address: _____

Telephone number: _____

Signatory name: _____

Signature: _____

Signatory title: _____

COMPANY SEAL

RESPONSIBILITY WAIVER – DWG PLANS

The _____

Mr./Ms. _____
Bouthillette Parizeau
8580 de l'Esplanade Avenue, office 200
Montréal (Québec),
H2P 2R8

Project: _____

Subject: _____

We, _____ , relieve Bouthillette Parizeau of any liability resulting from the use of their digital drawings for the development of contractual documents and our coordination, and/or detail drawings, or for any other use related to the project.

We also recognize and agree that:

- That the electronic drawings in question are provided to us for our use only and that they cannot be disseminated without the permission of Bouthillette Parizeau.
- That no assurance is given to us as to the consistency and accuracy of the information contained in it.
- That Bouthillette Parizeau cannot be held responsible should the digital drawings in question contain certain inaccuracies or errors.
- That Bouthillette Parizeau cannot be held responsible for any errors that results from the use of the drawings by us, our subcontractors, or our suppliers.
- That we will remain fully responsible for our submitted drawings or orders, according to contract stipulations.

In addition, we will undertake to verify in site the accuracy of the dimensions and information contained within the digital drawings, as if we had created them ourselves.

Signature: _____

Name (in print): _____

Address: _____

Telephone: _____

Email: _____

END OF SECTION

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1.3 DOCUMENTS REQUIRED FOR THE "UNRESERVED" ACCEPTANCE OF THE WORKS

PART 2 PRODUCT

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

Part 1 General

1.1 REQUIRED DOCUMENTS ON STARTUP OF THE SITE

.1 Those requirements must be completed before the first request for payment.

Description		Transmission dates
1.1	**Electrical**	
1.1.1	Licences and qualifications.	
1.1.2	List of subcontractors and their contact details.	
1.1.3	List of suppliers with addresses and contact persons.	
1.1.4	List of staff assigned to the project and their contact details (foreman, estimator, boss/project manager).	
1.1.5	Detailed breakdown of payment requests.	
1.1.6	Copy of the request for supply/declaration of work (DA / DT).	
1.1.7	Delivery time for the equipment to be supplied.	
1.1.8	Insurance proof.	

1.2 REQUIRED DOCUMENTS DURING THE SITE UNTIL THE RECEPTION OF ACCEPTANCE "WITH RESERVE"

.1 These requirements must be completed before the request for reception "with reserve" of the work (prior to obtaining it) in order to receive the work "with reservation".

Description		Transmission dates
1.2	**Generalities**	
1.2.1	Detailed schedule for implantation of commissioning.	
1.2.2	Descriptive table of planned training, as prescribed in section 26 05 00.01.	
1.2.3	Detailed schedule of interventions in the existing.	
1.2.4	Systems verification and test certificates.	
1.2.5	All Construction Professional visit reports initialed as corrected when deficiencies have been reported.	
1.3	**Electrical**	
1.3.1	Shop drawings (complete).	
1.3.2	Warranty letters from manufacturers of lighting devices.	
1.3.3	Drawings and calculations of seismic protection sealed by an Engineer, as prescribed in section 26 05 49.	
1.3.4	Seismic installations compliance report sealed by an Engineer, as prescribed in section 26 05 49.	
1.3.5	Load balancing reports, as prescribed in section 26 05 00.01.	
1.3.6	Complete verification and commissioning report for each piece of equipment.	
1.3.7	Table summarizing the tests to be carried out within the framework of the project.	
1.3.8	Table of contents for operation and maintenance manuals.	

	Description	Transmission dates
1.3.9	Complete fire alarm verification and activation report as prescribed in section 28 31 00.02.	
1.3.10	Certificates signed by the Contractor for all tests.	
1.3.11	Ground network resistance ratio.	
1.3.12	Verification sheets, certificates, calculations, erection drawings requested from the different sections of the estimate.	

1.3 DOCUMENTS REQUIRED FOR THE "UNRESERVED" ACCEPTANCE OF THE WORKS

.1 These requirements must be completed for the "unreserved" acceptance of the work.

	Description	Transmission dates
1.4	**General** All the lists of deficiencies of the specialized contractors completed and cross-checked by the foreman of the project. Important Notes : – A signature from the project manager and the foreman will be required to certify that the work is being carried out. – Once the Company Representative has confirmed, that the deficiencies are 100% complete, the Construction Professional will make a final inspection of the work with the latter and the Company. If further visits are required as a result of uncompleted corrections, the Contractor will be responsible for the costs involved.	
1.5	**Electrical**	
1.5.1	List of deficiencies 100% completed and initialed by the project manager.	
1.5.2	Letters of guarantee.	
1.5.3	Operation and maintenance manual completed and accepted by the construction professional.	
1.5.4	Certificate of conformity duly signed.	
1.5.5	As-built drawings certified "as built".	

Part 2 Product

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

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1.14 TESTING

1.15 START-UP OF THE INSTALLATION

PART 2 PRODUCT

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

Part 1 General

1.1 SUMMARY

.1 This section contains:

.1 The precise requirements for Division 26.

1.2 ELECTRICAL PLANS AND SPECIFICATIONS

.1 Electrical plans show the approximate location of devices and conduits; the exact location to be determined by the Contractor on site. In addition, the Contractor is to verify the space available on site before installing the devices and conduits and coordinate the work and spaces available with other Divisions.

.2 No architectural or structural data will be taken from the electrical plans.

.3 No additional remuneration will be granted for the relocation of conduits and devices which are deemed necessary due to structure or any other normal consideration.

.4 Detailed plans that are be provided to the Contractor during the construction period will also form part of the contractual documents. If the Contractor needs detailed plans, he must ask the Consultant, in writing, at least fifteen (15) working days in advance.

1.3 SCOPE OF WORK

.1 Provide all materials, labor, connection, start-up, tools and appliances necessary for the complete performance of all work described in the specifications and/or shown on the plans.

.2 This list is not exhaustive and any work described herein will be part of the project. The list of works will include, among others, but not limited to:

.1 Modifications to the 347/600 V three phase distribution network, normal and emergency.

.2 Modifications to the 120/208 V three phases distribution network, normal and emergency.

.3 Grounding and continuity of masses.

.4 Interior lighting, normal and emergency.

.5 The lighting controls at 347, 120 and 24 V.

.6 Receptacles.

.7 Supply and connection of electric heating appliances; connection only to the coils of the HVAC systems.

.8 Connection of other equipment as outlined in the plans.

.9 The fire alarm system.

.10 All specified tests.

.11 Relocation of existing equipment.

.12 Temporary installations required to ensure continuity of services.

.13 Connection of other special equipment.

.14 The networks of conduits and wiring supplying all equipment requiring electricity as well as all other systems.

.15 Duct and wiring networks supplying all equipment requiring electricity as well as all other systems.

.16 Fasteners, supports, seismic protection, as well as all seismic fixings of equipment.

.17 Removal of existing equipment that has become unnecessary and/or not reused.

.18 Relocation of existing reused equipment.

.19 Ensuring the continuity of all existing services.

.20 Verification and coordination of all existing services with the Owner, utility companies and the services of other specialties concerned.

.21 Return to the Owner the equipment described in the specifications, as well as any other equipment that the Owner wishes to recover. The Contractor shall clear the site of all items not collected by the Owner.

.22 Unless otherwise indicated, the description of the work includes the supply, installation and connection of equipment and materials with all the accessories necessary for a complete installation.

1.4 RESPONSIBILITY FOR WORK

.1 Any change made to the plans and specifications, without the written authorization of the Consultant, will render the Contractor concerned solely responsible for the malfunction of the systems. He will be responsible for any defect that may arise within a year after the final acceptance of the work.

1.5 PARASISMIC RESTRICTIONS

.1 The Contractor is responsible for the compliance of the seismic protection systems required by his work.

.2 Refer to section 26 05 49 – Seismic protection systems.

1.6 COORDINATION BETWEEN CONTRACTORS

.1 In order to ensure full coordination of all work by the building mechanical and electrical trades, in relation to the structure, coordination meetings will be held before any work is carried out on the site by the electrical division. In the event of adjustments made necessary by a lack of coordination on the part of one of the contractors, the one who caused the situation will be responsible vis-à-vis the other divisions.

.2 The heating and plumbing contractor has priority over other contractors to run conduits first. However, the Consultant has the right to intervene if it is judged that the heating and plumbing contractor has not taken into account the requirements of others or delays the work.

.3 Before proceeding with the purchase and installation of the electrical equipment required to connect any motors, the electrical contractor is responsible for verifying and validating with mechanical contractors the quantity, the supply rating and the type of control required for each of the motors. Any discrepancies between the information on the plans and specifications and that obtained from other contractors must be reported to the Consultant in order to establish the mitigation strategy required to meet the requirements for the electrical connection of the mechanical systems.

.4 The above-mentioned coordination and verification is to be done by the various contractors before ordering each device, as well as before starting to perform any work. If an issue arises, the Contractor must submit the case to Consultant before starting any work. If this verification is not made by the Contractor and a difficulty arises, and the Contractor must incur additional costs to overcome it, these costs will be borne by the Contractor concerned.

.5 Unless otherwise specified, the Contractor shall provide the necessary accessories to complete the installation of the elements he has manufactured on site.

.6 No compensation will be awarded for the relocation of conduits, boxes, equipment, etc.

.7 Each Contractor will coordinate their own openings, anchors, supports and other arrangements required for the installation of their works and will obtain the required information in time so as not to delay the execution of the project.

1.7 EQUIPMENT AND MATERIAL

.1 Unless otherwise prescribed, use products from a single manufacturer in the case of materials and equipment of the same type or class. The equipment supplied will be from the same manufacturer to obtain maximum interchangeability between elements, among others for distribution panels, disconnectors, starters, and lighting devices of the same type.

.2 In special locations, use appropriate products; thus, in humid, dusty, etc. places, the equipment must be impervious to water, dust, etc. Also, the ends of conduits entering boxes, switchboards and similar equipment must be sealed with a special compound for this purpose.

.3 Installation and finishing:

.1 All installations must be carried out in such a way to facilitate inspections, repairs and maintenance.

.2 For the exposed part of the electrical installation, the Contractor undertakes to respect symmetry. Also, when the ceilings are covered with acoustic tiles and any panels, the Contractor must coordinate his work with that of other trades so that lighting devices, etc. occupy the space of a tile or row of tiles or are centered in relation to them.

.3 Unless otherwise indicated, where a device is mentioned, this implies its supply along with its accessories, as well as the labor to install, connect and start it up.

.4 Carry out all minor work, whether or not specified in the plans and specifications, but which is customary and necessary for the completion of the contract.

.5 Apply a minimum of one coat of corrosion resistant primer to ferrous metal fasteners, brackets, hangers and site fabricated equipment (CGSB-IGP-140).

.6 Prime and touch up damaged surfaces to the satisfaction of the Owner.

1.8 EQUIPMENT PROTECTED BY SPRINKLERS

.1 The electrical equipment inside perforated boxes installed in a room protected by sprinklers must be protected by hoods or non-combustible shielding arranged in such a way as to interfere as little as possible with the protection offered by the sprinklers.

1.9 LOCATION OF OUTPUTS AND SOCKETS

.1 The location of outlets and outlets may be changed without additional charge or credit, provided that the displacement does not exceed 3000 mm and that notice is given before installation.

.2 Locate the exits according to the indications on the plans and align the exits symmetrically.

.3 Install outlets located back-to-back in a common wall, leaving a horizontal clearance of at least 300 mm between the boxes.

.4 Place outlets for lighting and sockets in suspended ceilings on grid lines in both directions, without interfering with ceiling suspensions. Make sure the exits are easily accessible.

.5 Make any necessary adjustments when interior finishing is complete.

.6 Position light switches 225 to300 mm from single door frame, handle side, 225 to300 mm from end of double doors.

.7 The exact position of the outlets must be coordinated with the architectural drawings before proceeding with the installation.

1.10 MOUNTING HEIGHTS

.1 Unless otherwise indicated, measure all heights from the center of the appliances to the level of the finished floor. In rooms where there is a raised floor, measure against the finish of that floor.

.2 In cases where the mounting height is not indicated, check with competent persons before beginning the installation.

.3 Unless otherwise indicated, install equipment at height indicated below.

.1 Light switches: 1200 mm

.2 Wall outlets:

.1 In general: 400 mm

.2 Above a worktop or its backsplash: 1065 mm

.3 In mechanical installation rooms: 1065 mm

.3 Distribution panels: as per Code requirements or as indicated.

1.11 FIRE PROTECTION

.1 When cables or conduits pass through floors and fire walls or rooms equipped with halon networks, fire and smoke tightness will be ensured using products 3M, CP25, 303, FS195, CS195, and 7902 and 7904 series sealing kits, all will be installed according to the manufacturer's recommendations and CAN / ULC S115.

1.12 COORDINATION OF PROTECTION DEVICES

.1 Ensure that circuit protection devices such as overcurrent releases, relays and fuses are installed, that they are of the desired rating and that they are set to the required values.

.2 Ensure that circuit protection devices, such as overcurrent releases, relays and fuses installed, comply with the desired capacities, and set to the required values, as indicated.

1.13 ON-SITE QUALITY CONTROL

.1 Load balancing:

.1 Measure the phase current of the distribution panels under normal loads upon acceptance of the work. Distribute the branch circuit connections so as to obtain the best balance of current between the various phases and note the modifications made to the original connections.

.2 Once the measurements are complete, submit the load balancing report prescribed in article "DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL / INFORMATION" of part 1. This report must indicate the operating currents under normal loads recorded on phases and neutrals of distribution panels, dry-type transformers and motor control centers. Specify the time and date each load was measured, as well as the circuit voltage at the time of the measurements.

.2 Perform tests on the following:

.1 Electricity distribution network, including phase, voltage and grounding control, and load balancing.

.2 Circuits from load center panels.

.3 Lighting system and control / regulation devices.

.4 Heaters and associated controls / regulators, including sequential system operation controls where applicable.

.5 Fire alarm system.

.3 Perform tests in the presence of the Consultant.

.4 Provide measuring devices, indicators, devices and personnel required for the execution of the tests during the performance of the work and upon completion of the latter.

1.14 TESTING

.1 The electrical contractor must collaborate with other trades so as to enable them to carry out their tests within the time limits required by the project manager.

.2 Once a test is completed, adjust all the devices relating to the test, so as to allow their correct operation.

.3 General requirements:

.1 All tests must be done in the presence of the Engineer and to his satisfaction.

.2 The Engineer may require tests of the installations and devices before accepting them.

.3 For temporary testing, obtain written permission to start up and test permanent installations and devices, prior to their acceptance by the Engineer.

.4 Give forty-eight (48) hours written notice to Engineer before date of testing.

.5 Provide the devices, meters, equipment and personnel required for the execution of the tests during the project until the installations are accepted by the Engineer and pay all the costs thereof.

.6 If a piece of equipment or a device does not meet the manufacturer's data or the performance specified during a test, replace without delay the defective unit or part and pay all costs incurred by this replacement. Make adjustments to the system to obtain the desired performance. Pay all costs, including re-testing and overhaul.

.7 Prevent dust, dirt and other foreign matter from entering openings of facilities and equipment during testing.

.8 Provide the Engineer with a certificate or letter from the manufacturers confirming that each system or part of the entire installation has been put in place to their satisfaction.

.9 Send the results of the tests in writing to the Consultant.

.10 The tests must be carried out and accepted before the installation of any thermal insulation.

.11 Do not hide or embed any conduit, accessory or device before the tests have been carried out and accepted.

.4 Special requirements:

.1 The presence of the electrical contractor may be required during tests carried out by another trade body.

1.15 START-UP OF THE INSTALLATION

.1 Instruct operating personnel in the mode of operation and maintenance methods of the installation, its devices and its components.

.2 Provide these services for a sufficient period of time, allowing the number of visits necessary to start up the equipment and ensure that the operating personnel are familiar with all aspects of their maintenance and operation.

Part 2 Product

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

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1.15 DEMOLITION

PART 2 PRODUCT

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

Part 1 General

1.1 SUMMARY

.1 This section contains:

.1 This section specifies the project specific requirements in Division 26.

1.2 ADDITIONNEL DRAWING AND SPECIFICATION

.1 Note that the Canadian Space Agency section is also an integral part of this Division.

1.3 WORK PROCEDURE AND TIMETABLE

.1 The Contractor shall refer to the documents of the Canadian Space Agency and follow the established construction stages as well as the work procedure.

.2 The Contractor must take into account that the establishment will remain operational during the work.

.3 The Contractor will do all the preparatory work so that the construction stages are followed and he will ensure the continuity of the existing services on either side of the place where there will be work to be done, so that the occupied premises, the equipment, as well as the electrical and mechanical systems are always operational.

.4 The price for the execution of all work following the work procedure must be included in the tender. No additional remuneration will be granted thereafter for this purpose.

.5 Certain work will be carried out outside of normal working hours, namely evenings, nights and weekends. The Contractor shall coordinate this work with the Owner and the Representative of the Canadian space agency.

.6 The price for the execution of all the work in overtime, that is to say the evening, the night, the weekends will be included in the tender. No additional remuneration will be granted thereafter for this purpose.

1.4 INTERRUPTIONS OF SERVICES

.1 For all work that could interfere with the Owner's activities, the Contractor will request written authorization where he will indicate the nature of the work to be done, the time required for its execution and the date on which he must do this work. The Contractor will wait for the Owner's authorization before proceeding.

.2 The Contractor will make the Owner's request for written authorization, at least ten (10) days in advance whenever there are service and power interruptions, fire alarm or telecommunications services. More details and conditions are given to the plans dealing with interventions and transfer protocols.

.3 In the event that the Owner has given authorization to proceed and an emergency situation arises, the Contractor must interrupt the work in progress and ensure the continuity of all services immediately.

.4 The operation and initial lockout of circuit breakers or disconnectors supplying existing loads are the exclusive responsibility of the Institutional Representative. Coordinate with the representative of the establishment the maneuvers required for the execution of the work.

1.5 EXISTING SERVICES

.1 The location of certain existing services is indicative only on the plans. Before the start of work, the Contractor will verify and locate all existing services with the Owner.

.2 Before starting the work, the Contractor will check with the Representative of the Canadian Space Agency the existing plans, as well as the architectural, structural, mechanical, and electrical plans.

.3 Before carrying out demolition, drilling, cellaring and opening work, the Contractor will carry out all the necessary checks so as not to damage the existing hidden services.

1.6 EXISTING HIDDEN SERVICES

.1 The Contractor is responsible for damage to hidden electricity, telecommunications, mechanical or other services, following drilling and concrete cutting required by the present work.

.2 Carry out all the required checks so as not to damage said services. To this end, consult:

.1 Mechanical and electrical drawings, and other existing specialties.

.2 Canadian Space Agency and/or maintenance personnel with local knowledge.

.3 Public utility companies and specialized companies, having knowledge of the site and its installations.

.3 Carry out all preparatory work for the research. Use an appropriate device to find out whether there are traces of ducts in the areas concerned. In addition, hire specialized firms to search for hidden existing conduits.

.4 If the Contractor neglects to carry out all of the aforementioned verifications, any deterioration in service will be attributable to him and he will be required to pay the cost of repairs to the breakage itself and additional damage caused to the building. In addition, in the event that such deterioration affects the operation of the existing building services, the Owner may claim damages from the Contractor for the damage caused.

.5 If the Contractor performs all the aforementioned verifications and it remains impossible to know if one or more conduits remain hidden, he will not be held responsible for deterioration of service if he provides the Construction Professional the evidence:

.1 That no details are specified in the drawings and specifications and that the Professional is unable to provide him with the relevant information.

.2 That the Owner is unable to provide him with details on the route of the conduits at the work site.

.3 That the companies or their technical department cannot precisely locate the passage of their services.

.4 That a detection test has been carried out using an appropriate device.

.5 That a specialized firm was hired to search for existing hidden conduits.

.6 In this case, the chargeable costs will be borne by the Owner and will be the subject of a change order.

1.7 CONTINUITY OF SERVICES

.1 Execute the work so that the continuity of existing services is ensured throughout the duration of the work. The Contractor must provide all the services and all the electrical installations necessary to ensure the continuity of the existing services.

.2 Include in the tender all necessary costs caused by damage to existing services, either by drilling work or any other work. No additional claim will be granted thereafter to this effect.

.3 The Contractor must provide all temporary services necessary when there are modifications to be made to existing installations.

.4 When the establishment's normal service is interrupted for the execution of the work, the Contractor will provide a generator for the required electrical supply of the tools and machinery he needs to carry out the work.

.5 The Contractor will always provide emergency services connected to the generator set during a power interruption. In the event that certain transfers (loads connected to the emergency) requiring a temporary shutdown of emergency services, the Contractor must notify the Owner and he must carry out the work so that the strategic places are covered by a normal distribution.

.6 The price for the execution of all work requiring service interruptions and power interruptions during overtime will be included in the tender. The price for temporary connections must be included in the quote. No additional remuneration will be granted thereafter for this purpose.

1.8 WORK INSIDE AND OUTSIDE THE OCCUPIED BUILDING

.1 Perform the work with the least possible disturbance to the occupants, ensuring normal use of the premises. When the means of ensuring safety have been reduced by reason of the work covered by the contract, take the necessary temporary measures to ensure all the safety required. Take into account that the building must remain operational for the duration of the work. The Contractor will be responsible for ensuring the continuity of services.

.2 The movement of the Contractor's personnel and the handling of construction materials will be in the corridors, stairs and elevators assigned by the Owner.

.3 The Contractor must receive the Owner's authorization before moving the equipment. Report damaged items to the Owner in writing before handling them. Damage caused during the movement of equipment will be repaired at the Contractor's expense.

.4 The Contractor shall remove debris, scaffolding, etc. daily and leave the premises, equipment and furniture in a perfect state of cleanliness so as to allow personnel to use the premises normally.

.5 Install dust screens, tarpaulins, temporary partitions, temporary warning signs in places where renovation and repair work is being carried out adjacent to the sectors that will be operating during this period.

.6 Protect all distribution equipment against electrocution and mechanical damage and make it inaccessible to unauthorized personnel.

.7 If the Contractor moves equipment or furniture to facilitate his work, he must put everything back in place after each work period and ensure that the work areas, equipment and furniture are left clean and operational.

.8 To allow entry and/or exit of equipment, plan to use existing accesses.

1.9 EXECUTION OF WORK IN EXISTING INTERPLACEMENTS

.1 Outside of areas where there are in-depth redevelopments to allow work to be carried out in existing inter-ceilings, the Contractor shall:

.1 Remove acoustic tiles, tiles of any other type and suspensions (if required) on a sufficient surface for each work period.

.2 Move and replace all elements harmful to the execution of the work.

.3 Store acoustic tiles, tiles of any other type in a clean place and protect them.

.4 After each work period, restore the premises to their original condition.

.5 At the end of the work in each sector, reinstall and / or replace the acoustic tiles, tiles of any other type and suspension damaged by materials identical to the existing one, at no cost to the Canadian Space Agency.

1.10 REMOVAL AND REINSTALLATION OF EXISTING EQUIPMENT

.1 Remove and reinstall all electrical devices, conduits and conductors required to allow the full completion of the architectural, structural and mechanical work shown on the plans. Consult the plans of other disciplines for this purpose.

1.11 REMOVAL OF EXISTING EQUIPMENT BECOMING UNNECESSARY

.1 In general, unless otherwise indicated, the Contractor must remove all existing equipment that has become unnecessary and/or not reused and ensure the continuity of existing networks and services from end to end. The Contractor will verify all the equipment to be removed and he will remove all the equipment according to the established work procedures and construction stages. The Contractor will provide all the services, the necessary electrical installations and the temporary installations to ensure the continuity of the existing networks for the existing equipment which must remain operational according to the work procedure and the established construction stages. The Contractor shall coordinate with the Owner the removal of existing equipment that has become unnecessary.

.2 The price for the execution of all the work must be included in the Contractor's bid and no additional remuneration will be granted thereafter for this purpose.

1.12 CONSERVED EQUIPMENT

.1 The Contractor shall redo all existing duct and wiring networks in the places where they are kept.

.2 The Contractor must ensure the continuity of the existing networks and end-to-end services for all the equipment retained.

.3 The price for the execution of all the work must be included in the Contractor's bid and no additional remuneration will be granted thereafter for this purpose.

1.13 RECOVERED EQUIPMENT

.1 At the locations indicated on the drawings, the Contractor must remove the existing equipment recovered, handle it and store it at a location determined by the Owner.

.2 The Contractor shall remove conduits, wiring, cables, boxes no longer needed and/or not reused from distribution equipment to the devices and/or devices they supply and ensure the continuity of networks and end-to-end existing services.

.3 The Contractor will replenish all equipment and devices recovered according to the indications on the plans.

1.14 CONCEALED WORKS

.1 Conceal all conduits, boxes and wiring in ceilings, between ceilings, between floors and walls, etc.

.2 Conceal all conduits, boxes and wiring, except in mechanical, electrical, telecommunications and technical areas.

1.15 DEMOLITION

.1 Remove and transport off the site, all equipment that has become obsolete as a result of new developments, including wiring, conduits, boxes, outlets, switches, distribution devices, all auxiliary system devices, signaling or communications, all accessories forming part of the electrical installations.

.2 Remove wiring and conduits to the panel or to the last box kept in the network.

.3 Restore power, control, signaling or communications circuits when the continuity of these circuits is broken following the demolition of existing installations.

Part 2 Product

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

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Part 1 General

1.1 SUMMARY

.1 Section content:

.1 This section covers material and accessories for connectors for cables and boxes.

1.2 REFERENCES

.1 CSA International:

.1 CAN / CSA C22.2 no 18 - Outlet boxes, conduit boxes, fittings and accessories.

.2 CAN / CSA C22.2 no 65 - Wire connectors (trinational standard with UL 486A 486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC):

.1 EEMAC 1Y-2-1961 – Bushing Stud Connectors and Aluminum Adapters (1 200 A Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA).

1.3 ACTION AND INFORMATION SUBMITTALS

.1 Submit the required documents, in accordance with section 20 00 10 - Mechanical and electrical general instructions.

.2 Shop drawings:

.1 Insulated mechanical connectors for joints of conductors in parallel.

.2 Connection blocks.

.3 Erection drawings:

.1 Erection drawings showing location and dimensions of junction boxes with joints on arteries.

.4 Installation sheet:

.1 Information required for insulated mechanical connectors for parallel conductor joints:

.1 Identification of the junction box.

.2 Quantity and size of conductors.

.3 Model number of connector used.

.4 Tightening torque used.

.5 Marked tightening.

.6 Dielectric test data.

.7 Infrared photo of the junction.

1.4 CLOSEOUT SUBMITTALS

.1 Submit the required documents, in accordance with section 20 00 10 - Mechanical and electrical general instructions.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual, E&Es.

Part 2 Product

2.1 MATERIALS

.1 Pressure connectors for cables, conforming to standard CAN / CSA C22.2 no 65, with current carrying elements in copper or aluminum alloy, size appropriate for copper or aluminum alloy conductors, according to specifications requirements.

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

.3 Bushing stud connectors conforming to standard EEMAC 1Y-2 and NEMA, and consisting of:

.1 Connector body and stud clamp for round copper conductors.

.2 Clamp for round copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Bolts for aluminum conductors.

.6 Sized for conductors as indicated.

2.2 WIRE CONNECTORS

.1 Mechanical connectors for conductor size 8 AWG or less, use Scotchlock Electrical Spring Connectors from 3M or Marette from Thomas & Betts.

.2 Mechanical connection for copper-to-copper conductors of size 6 AWG or larger, use type H split bolt connectors from Thomas & Betts.

.3 Mechanical connection for copper-to-Nual conductors of size 6 AWG or larger, use type APS split bolt connectors from Thomas & Betts.

.4 Mechanical connection for Nual-to-Nual conductors of size 6 AWG or larger, use type HPS split bolt connector from Thomas & Betts.

2.3 JOINTS OF PARALLEL CONDUCTORS

.1 Insulated mechanical connector for connection:

.1 Double port terminal block with clamping screw.

.2 PVC insulation for 600 V, 90 ° C.

.3 Protective caps at ports and clamping screws.

.4 For use on copper and aluminum alloy conductors.

.5 Connection pre-filled with anti-oxidation compound.

2.4 CONNECTING THE CONDUCTORS

.1 The Contractor is responsible for coordinating the sizes of the switchgear connection lugs with the conductor sizes indicated in the single-line diagrams. Where it is not possible to connect the conductors, the Contractor may use insulated compression reducing connectors.

.2 Insulated compression reducer connector:

- .1 Offset connecting rod.
- .2 PVC insulation for 600 V, 90 °C.
- .3 For use on copper and aluminum alloy conductors.
- .4 Connection pre-filled with anti-oxidation compound.

2.5 TERMINAL BLOCKS

.1 All wire connection in junction boxes and panels for fire-alarm, low-voltage lighting control, other low-voltage systems, etc., will be made on terminal blocks in sufficient quantities for each wire connection.

.2 Terminal blocks shall be from Wieland brand, model 9700B, 10 A, 300 V, complete with DIN rail, end plates, identification, extremity flanges and jumpers.

2.6 ACCEPTABLE MANUFACTURERS

.1 Wire connectors:

- .1 3M
- .2 Burndy
- .3 Thomas & Betts
- .4 Or approved equivalent

.2 Wire connectors in parallel:

- .1 Burndy, Black Unitap series
- .2 Ilsco, PBTD series
- .3 Thomas & Betts, AMT series
- .4 Or approved equivalent

.3 Insulated compression reducer wire:

- .1 Burndy, AYPO series
- .2 Ilsco, ACO series
- .3 Thomas & Betts, series 619
- .4 Or approved equivalent

.4 Terminal Blocks:

- .1 Staffel
- .2 Weidmüller
- .3 Wieland
- .4 Or approved equivalent

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connector installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors cables 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 CAN/CSA-C22.2 no.65.

.3 Install connectors for lighting devices and tighten them properly. Replace the insulating cap.

3.3 WIRE JUNCTIONS

.1 Tape connectors, that do not have their own insulating jacket, with at least two (2) semi-overlapping rows of Scotch 88 vinyl tape from 3M.

.2 The di-electric characteristics of the junction must not be inferior to those of the conductor insulation.

.3 Wire junctions and connectors which do not have a smooth surface should be wrapped with Scotchfil from 3M prior to being taped or equivalent approved before being wrapped.

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3.6 INSTALLING NON-METAL SHEATH CABLES

Part 1 General

1.1 SUMMARY

.1 This section includes:

.1 Copper, ACM alloy and aluminum conductor requirements from 0-1000 V and common electrical insulation and covering materials.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)/CSA International:

.1 C22.2 no 38 – Thermoset-Insulated Wires and Cables (Tri-National Standard, with UL 44 and ANCE NMX-J-451-2014).

.2 C22.2 no 131 – Type Teck 90 Cable.

.3 C22.2 no 51 – Armoured Cables.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Shop Drawings:

.1 Submit a general drawing for each conductor and cable type and indicate all gauges used.

.3 Calculations:

.1 Submit cable pull calculations for materials installed in buried duct banks. Include description of pulling method for installing 600 V conductors.

1.4 CLOSEOUT SUBMITTALS

.1 Submit the required documents, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Product

2.1 CONDUCTOR WIRE GAUGE

.1 Unless otherwise indicated, the minimum gauge of copper cabling to be:

.1 12 AWG for dedicated circuits in dedicated conduit.

.2 10 AWG for multiple circuits grouped in a common conduit.

.2 Solid wire for size no. 10 AWG conductors and smaller.

.3 Stranded wire for size no 8 AWG conductor and larger.

.4 Conductor size indicated on drawings represents minimum requirements. If not indicated, provide and install conductor of type and size as required by the applicable electrical code, latest edition, specifically:

.1 Refer to appendices to determine the size of conductors given the routing distance.

.2 Apply correction factors for de-rating of current carrying capacity as required by the electrical code, including but not limited to Table 5C when conductors are grouped in a common conduit.

2.2 BUILDING WIRES

.1 All wiring connected to a 600 V system shall have minimum 600 V insulation.

.2 Copper conductors, under insulation in crosslinked thermosetting polyethylene, for a voltage of 600 V, type RW90 XLPE.

.3 Conductors for low voltage system (25 V and less) integrated in cables with multiple conductors, PVC insulation, gauge 18 AWG minimum.

.4 Conductors or cables bearing the manufacturer's registration, type of insulation, rating, voltage printed at regular intervals and permanently.

2.3 ARMORED CABLES

.1 Conductors: insulated, unless otherwise indicated in RW-90 XLPE copper, when AL is specified in drawing, in aluminum alloy (ACM), of the indicated size.

.2 Metal armor: crisscross aluminum strip.

.3 Including a grounding conductor protected by the aluminum strip.

.4 Connectors: anti-short circuit.

2.4 CONTROL CABLES

.1 Low energy control cables, for voltage of 300 V, RW-90XLPE, stranded annealed copper conductors, size indicated.

.1 Insulation: PVC.

.2 Shielding: metallic wires, braids or tapes, on each pair of conductors, as indicated.

2.5 FIRE ALARM CABLES

.1 Twisted / shielded cables will be installed in EMT conduit type conduits, unarmored and have the following characteristics:

.1 Solid bare copper conductors.

.2 PVC insulation.

.3 Red PVC sheath.

.4 According to CSA FAS-105, 300 V, identified "FT-4".

2.6 CONDUCTOR COLOUR

.1 In branch circuits of three-phase systems, the phase colours to be: black, red, blue, etc., and the neutrals to be white.

.2 No. 4/0 gauge and smaller neutral conductors to have white insulation and those of 250MCM gauge and larger to be painted white.

.3 Grounding conductors to be installed in all P.V.C., E.M.T. type conduits, and empty flexible metal conduits. The grounding conductors to have green insulation and to be the sized according to the Electrical Code.

.4 Grounding conductors used for equipment, special outlets boxes, special outlets, insulated outlets, to have green insulation and to be sized according to the Quebec Electrical Code.

2.7 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 53 – Identification of Electrical Equipment.

2.8 RECOMMENDED MANUFACTURERS

.1 Conductors:

.1 General Cable
.2 Nexans
.3 Prysmian
.4 SouthWire
.5 Or approved equivalent

.2 AC90 and ACWU90 cables:

.1 General Cable
.2 Nexans
.3 Prysmian
.4 SouthWire
.5 Or approved equivalent

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with section 20 00 10.

.2 Perform tests before energizing electrical system.

.3 Tests shall be completed by competent personnel.

.1 Provide all materials and instruments necessary to complete the tests.

.4 Check the phase of each conductor and identify the phase of each individual conductor for all circuit.

.5 Check continuity of all circuits. Ensure all circuits are free from faults and leakage current.

.1 Ensure resistance to ground of each circuit is not less than 50 megaohms.

.6 Splice tests:

.1 After laying or pulling cables, but before splicing and connecting, measure the insulation resistance of each phase conductor using a 1000 V megohmmeter.

.2 After the completion of each splice and / or connection, check the insulation resistance to ensure the distribution system is ready for the acceptance test.

.7 Dielectric strength tests:

.1 Ensure all circuit terminations and all ancillary equipment are disconnected.

.2 Ground shields, ground wires, metallic armor and conductors not being tested.

.3 Carry out dielectric strength tests in accordance with Manufacturer's recommendations.

.4 Measure dielectric value of circuits, power cables and equipment with a maximum voltage of 350 V using a 500 V megohmmeter.

.5 Measure dielectric value of circuits, power cables and equipment with a voltage range from 351 V to 600 V using a 1000 V megohmmeter.

.6 In both (2) cases, ensure that the value of the grounding resistance prior to energization is not less than the manufacturer's requirements.

.7 Provide a certificate stating that all conductors have been tested and verified, and that all defective conductors have been replaced.

.8 Completely remove and replace the total and complete length of cable which does not meet the test criteria.

3.2 GENERAL CABLE INSTALLATION

.1 Unless otherwise indicated, install all copper conductors.

.2 Perform cable terminations in accordance with section 26 05 20 - Connectors for 0 - 1000 V cables and boxes.

.3 Use color code of cables in accordance with section 26 05 53 - Identification of electrical systems.

.4 Conductor length for parallel feeders to be identical.

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

.6 Route the wiring hidden in the walls downhill or in vertical loops to facilitate subsequent work. Unless otherwise specified, avoid routing the wiring from the bottom up or horizontally in the walls.

.7 Use only two-wire circuits for branches to receptacles with surge suppression, as well as for permanently connected electronic and computer equipment. Common neutral circuits are prohibited.

.8 The control wiring must be identified by clamps with numbering corresponding to the legend of the shop drawings.

.9 Supply and install wires and cables required for the connection of all electrical equipment and devices to make them fully operational even if the wires or cables are not specifically shown on the drawings.

.10 Install conductors or cables in conduits or metal sheaths as indicated in this section.

.11 Install a neutral conductor bypass circuit at 120 V.

.12 Use only lubricants approved by the manufacturer for cable pulling.

.13 Install cables and leads continuously without joints from their point of origin to the powered device. If necessary, create joints in approved boxes.

.14 Support conductors in vertical conduit with Type M carriers, manufactured by O-Z Products. Space them as follows:

.1	Conductors of size 1/0 and smaller:	supports every 30 m.
.2	Conductors of size 2/0 to 4/0:	supports every 24 m.
.3	Conductors of size 250 to 350 MCM:	support every 18 m.
.4	Conductors of size 350 to 500 MCM:	supports every 15 m.
.5	Conductors of size 600 to 700 MCM:	supports every 12 m.

.15 Support vertical climbs of armored cables, such as AC90, ACU90, RP90, RC90 or Teck90, according to the requirements of table 21 of chapter V – Electrical Code of Construction of Québec., or:

.1 Incorporate 90 ° elbows in the vertical run at intervals not exceeding the distances indicated in table 21 of chapter V - Electrical Code of Construction of Québec.

.2 Use cable specially designed for vertical runs.

3.3 INSTALLATION OF THE BUILDING WIRE

.1 The wiring for the connection of motors and transformers inside, from a junction box located near the motor or the transformer, will be in armored cable, "Liquid-Tight", the latter box will be part of a network of conduits.

.2 Unless otherwise indicated in the plans or later in this specification, all flexible connections to motors, inside a cleaning room and other devices in damp areas exposed to dripping will be made with "Seal Dry" conduits. or "Cab Tire" of 24 "minimum length, fitted with suitable watertight fittings, from a threaded galvanized steel conduit.

.3 Unless otherwise indicated in the plans, provide an additional green insulated conductor of appropriate size to ensure the continuity of the masses in each thin-walled conduit (EMT type).

.4 Install the wiring:

.1 In conduits, in accordance with section 26 05 34 - Conduits, fittings and conduit fittings.

.2 In buried pipelines, in accordance with Division 26.

.3 In surface pipes and cable trays for lighting devices, in accordance with Division 26.

3.4 INSTALLATION OF ARMORED CABLES

.1 As much as possible, bundle cables on U-shaped supports.

.2 Secure cables directly to the frame 300 mm on each side of the outlets and every 1500 mm maximum on all strokes.

.3 Cut the metal casing of the cables with a suitable tool and provide the ends with insulating sleeves.

.4 AC-90 (BX) type cables for connection:

.1 Recessed lighting fixtures in suspended ceilings. The length of the cable should allow the lighting fixtures to be moved to any adjacent tile.

.1 When installed in suspended ceilings in corridors, an armored cable may power a lighting device at a maximum horizontal distance of 4 m from the junction box.

.2 Excluding tunnels, when installed in rooms without ceiling on the vertical part only.

.2 Sockets installed in drywall or suspended ceilings.

.3 Light switches installed in drywall.

.4 Suspended devices such as motorized shutters, valves and other similar devices (approximate length of ± 900 mm between the duct network and the suspended device).

.5 The armored cable must be connected to a junction box located in the same room as the powered device. The junction boxes used to supply a device via armored cable can serve a maximum area of 36 m².

3.5 INSTALLATION OF ALUMINUM SHEATH CABLES

.1 As much as possible, bundle cables on U-shaped supports.

3.6 INSTALLING NON-METAL SHEATH CABLES

.1 NMD-90 type non-metallic sheathed cables must be installed in accordance with the requirements of chapters I - Building and V - Electricity (Quebec Electricity Code) of the Quebec Construction Code.

.2 They can be installed in the following locations:

.1 In combustible construction.

.3 No non-metallic sheathed cable shall be installed in the ceilings, except if they are installed in non-combustible conduits.

APPENDIX

MAXIMUM LENGTH (IN METERS) OF ONE 120 V VERSUS BYPASS CIRCUIT PRESSURE DROP			
Conductor size AWG	Amperes protection (A)		
	15	20	30
12	20	15	---
10	30	25	15
8	50	40	25
6	90	65	40
Notes: – For loads not indicated, follow Chapter V - Electricity of the Quebec Construction Code (Quebec Electricity Code) (table no. D3). – Distance calculated for copper conductors, at a temperature of 60 ° C.			

MAXIMUM LENGTH (IN METERS) OF ONE 24 V VERSUS BYPASS CIRCUIT PRESSURE DROP				
Conductor size AWG	Circuit load (W)			
	12	24	36	48
12	72	36	24	18
10	114	57	38	28
8	182	91	60	45
6	290	145	96	72
Note: for loads not indicated, follow Chapter V - Electricity of the Quebec Construction Code (Quebec Electricity Code) (table no. D3).				

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3.4 EQUIPMENT GROUNDING

3.5 COMMUNICATIONS SYSTEMS

Part 1 General

1.1 SUMMARY

.1 This section includes:

.1 This section is about equipment, material, accessories and specific prescriptions for appropriate for the installation of grounding and bonding of electrical system and continuous grounded system.

1.2 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE):

.1 ANSI/IEEE 837-02 – IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Submit grounding compliance certificate complete with test results.

1.4 DOCUMENTS / ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents / elements, in accordance with section 20 00 10 - Mechanical and electrical general instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Product

2.1 EQUIPMENT

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

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

.3 All grounding conductors shall be minimum gauge 6 AWG.

2.2 EQUIPMENT IDENTIFICATION

.1 Identify grounding equipment in conformance with section 26 05 53 – Identification of Electrical Equipment

2.3 RECOMMENDED MANUFACTURERS

.1 Grounding material:

.1 Burndy Corp.

.2 Ilsco.

.3 Thomas & Betts.

.4 Or approved equivalent.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant-of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

.2 Perform tests in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.3 Measure and verify resistance to ground for all conductors to earth. Measure at ground bar using methods appropriate to local conditions. Resistance to ground must not exceed 5 ohms.

.4 Perform all tests prior to energizing electrical system.

.5 During testing, make all pertinent disconnections, such as a ground leakage indicator.

3.2 INSTALLATION

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories as outlined in Chapter V – Electrical Code of Construction of Québec.

.2 Arrange the grounding conductors in radial form and route all connections directly to a single common point grounding. Avoid loop connections.

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

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

.5 Soldered joints not permitted.

.6 Grounding continuity for electrical systems:

.1 Lay a connecting wire on the flexible conduits, carefully fixed on the outside of the conduit and connected at each end to a grounding nipple, a solderless terminal, a wire clamp or a screw with Belleville washer.

.2 Install ground conductor in all PVC conduits.

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

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral at secondary side of service.

3.4 EQUIPMENT GROUNDING

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

.2 Ground motor frames or other vibrating equipment by installing a separate green insulated ground conductor in the flexible conduit servicing the equipment. Terminate the green insulated conductor to a rigid surface at each end of the flexible conduit.

3.5 COMMUNICATIONS SYSTEMS

.1 Make earthing connections for telephone, public address, fire alarm, security and intercommunication systems as follows: communications, public address, fire alarm, security and intercommunications, as indicated.

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Part 1 General

1.1 SUMMARY

.1 This section includes:

.1 General and specific requirements for junction, pull boxes and cabinets.

1.2 REFERENCES

.1 CSA Group (CSA):

.1 CSA C22.2 no. 40 – Junction and pull boxes.

.2 CSA C22.2 no. 76 – Splitters.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide shop drawings: for splitters, pull boxes, and cabinets in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Coordination drawings:

.1 Coordination drawings showing the location and dimensions of junction, pull boxes with identified circuits and distribution cables.

1.4 DOCUMENTS/ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents/elements, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Product

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position, of 14 gauge.

.2 Terminations: connection blocks to match required size and number of incoming and outgoing conductors as indicated.

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

.4 Continuous copper bars, complete with soldered terminals, capacity indicated in the plans.

2.2 JUNCTION AND PULL BOXES

.1 Construction: 14 gauges minimum steel, welded steel cans, painted with a coat of paint applied with an electrostatic process, dimensions as indicated.

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

.3 Covers surface mounted: screw-on flat covers.

.1 General use and dimensions less than 400 mm with screw on flat covers.

.2 With terminals or the dimensions more than 400 mm with flat covers on hinges.

.4 Without knockouts.

.5 When apparent, TC type with frame, covered/concealed hinges, lock, no visible screws.

.6 Boxes larger than 600 mm x 600 mm, provided with a steel angle frame so as to form a rigid assembly, with a two (2) double hinged locking lid.

.7 Custom made electrical boxes shall be 16 gauge painted steel with hinged cover and separators, as required by Code between sources and different voltages.

2.3 EQUIPMENT IDENTIFICATION

.1 Identify equipment as per the requirements of section 26 05 53 – Identification of Electrical Equipment.

2.4 ACCEPTABLE MANUFACTURERS

.1 Junction and pull boxes:

.1 Bel Products.

.2 Hammond.

.3 Hoffman.

.4 Iberville.

.5 Roger Girard.

.6 Or approved equivalent.

Part 3 Execution

3.1 SPLITTER INSTALLATION

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

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

3.2 JUNCTION, PULL BOXES AND CABINET INSTALLATION

.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 Unless otherwise indicated, install cabinet with the top at 2 m maximum from the finished floor.

.4 Only main junction and pull boxes are indicated. The dimensions and locations are for information. The Contractor is the only responsible to locate and size the junction and pull boxes. Install additional pull boxes as required by CSA C22.1.

.5 Install all junction and pull boxes as indicated in the plans or where necessary.

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PART 3 EXECUTION

3.1 INSTALLATION

Part 1 General

1.1 SUMMARY

.1 Section content:

.1 This section covers the general and specific requirements concerning outlet boxes, junction boxes and their accessories.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CAN / CSA C22.2 no 18 - Safety standards for outlet boxes, conduit boxes, fittings and accessories.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

1.4 DOCUMENTS / ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents/elements, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES – GENERAL

.1 102 mm square or larger outlet boxes as required, steel, 14 gauge minimum, with thickness of 40 mm, and dimensions outlined in the Canadian Electrical Code.

.2 Gang boxes where wiring devices are grouped in the same area.

.3 Blank cover plates for boxes without wiring devices.

.4 347 V outlet boxes for 347 V switching devices.

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

.6 All boxes protruding less than 2.4 m from the ground will be of the FS type.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

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

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

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

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

2.3 MOUNTING BOXES IN MASONRY OR GYPSUM BOARD

.1 Electro-galvanized sheet steel outlet boxes and multi, gang, flush mounting into masonry walls, block or gypsum board.

.2 Recessed box 101 mm x 101 mm, plaster to cover 12.5 mm or more.

.3 Boxes in exterior walls with insulation and vapor barrier, Thomas & Betts no. BCR2000.

2.4 FLOOR BOXES

.1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex 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 mm, 21 mm and 27 mm conduit. Minimum size: 73 mm deep.

.3 Equipped with leveling legs, adjustable top.

2.5 CONDUIT BOXES

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

2.6 CEILING BOXES

.1 Octagonal box projecting from 101 mm diameter to the required depth.

.2 Sunken octagonal box of 101 mm diameter to the required depth.

2.7 FITTINGS – GENERAL

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

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

.3 Double locknuts and insulated bushings on sheet metal boxes.

2.8 SERVICE FITTINGS

.1 'High tension' receptacle fitting made of two (2) piece die-cast aluminum with brushed aluminum housing finish for two duplex receptacles. Bottom plate with two knockouts for centered or offset installation. 12 mm x 102 mm extension piece as indicated.

.2 Pedestal type 'low tension' fitting made of two (2) piece die cast aluminum with brushed aluminum housing finish to accommodate two Amphenol jack connectors.

2.9 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with section 26 05 53 - Identification of electrical systems.

2.10 APPROVED MANUFACTURERS

.1 Outlet boxes:

.1 Hubbell
.2 Iberville
.3 Eaton Crouse-Hinds
.4 Thomas & Betts
.5 Or approved equivalent.

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 When a wall has two (2) finishes of different thickness (for example, tile and plaster in a washroom), do not place an outlet on the boundary line between these two (2) finishes.

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

.6 The openings in the box must correspond to the dimensions of conduits, mineral insulated cables and armored cable. The use of reducers is not permitted.

.7 Group in one box: switches, outlets, and other similar devices, placed side by side. If there are more than two devices, GSB boxes with GBC plaster rings must be used.

.8 Outlet boxes shown as back-to-back on the plans must be placed a minimum of 300 mm apart.

.9 In the gypsum walls, attach the boxes to metal studs, as shown in the plans.

.10 For outlets installed on exterior walls and ceilings, the Contractor must use very shallow boxes (37 mm) and take great care not to break the vapor barrier. If the vapor barrier is perforated, place a minimum 300 mm x 300 sheet of the same material as the damaged one over the vapor barrier and seal it hermetically so as to restore the original properties of the insulation / cut assembly steam.

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

.12 Identify systems for outlet boxes as required.

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Part 1 General

1.1 SUMMARY

.1 This section includes:

.1 Rigid and flexible conduits, fasteners and fittings, and related installation methods.

1.2 REFERENCES

.1 Canadian standards association (CSA)/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 (February 2006).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Shop drawings:

.1 Electrical metallic tubing (EMT).

.2 Large radius elbows as indicated on drawings.

.3 End caps to sizes as indicated on drawings.

.4 Screw caps according to the diameters indicated on the plans.

.3 Interference drawings:

.1 Interference drawings indicating placement and dimensions of junction and pull boxes.

.4 Installation sheet:

.1 Empty duct system for door with hardware and/or electrified security.

.2 Conduits for completed components.

.3 Dimensions and identification of the junction box.

.4 Quantity, model and identification of terminal blocks.

.5 Photo of the system, complete before closing the second side of the wall.

1.4 DOCUMENTS/ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents/elements, in accordance with section 20 00 10 – General mechanical and electrical instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Product

2.1 CONDUITS

.1 The conduits must be colored according to section 26 05 53 – Identification of electrical systems.

.2 Rigid metal conduits: conform to CSA C22.2 no. 45, galvanized steel, threaded.

.3 Electrical metallic tubing (EMT): to CSA C22.2 no. 83, with couplings, and expanded ends.

.4 Rigid PVC conduits: conform to CSA C22.2 no. 211.2, latest revision.

.5 Flexible metal conduit: to CSA C22.2 no. 56, liquid-tight flexible metal aluminum.

.6 Unless otherwise indicated, is a minimum of 21 mm diameter.

2.2 CONDUIT FASTENINGS

.1 One (1) hole, steel straps to secure surface conduits where the diameter is equal to 53 mm or less.

.1 Two (2) hole, steel straps for conduits larger than 53 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits.

.4 Threaded rods, 10 mm diameter, to support suspended channels.

.5 Maximum spacing of conduit fasteners:

.1 All rigid metal conduits of same size shall be securely fastened to supports or suitable surface such that the maximum spacing between the fastening points shall be:

.1 1.5 m for conduits sized 21 mm in diameter.

.2 2 m for conduits sized 27 to 35 mm in diameter.

.3 3 m for conduits sized 41 mm in diameter or greater.

.2 Grouped mounting of rigid metal conduits of different sizes shall maintain maximum fastener spacing as indicated in Item 2.3.5.1 for the smallest conduit size in the grouping.

.3 If a flexible metal conduit is installed, it must be secured at intervals not exceeding 1.5 m and less than 300 mm on each side of any outlet box or trim, except in the case of a flexible metal conduit installed by pulling and in the case of lengths not exceeding 900 mm if some flexibility is required at the terminals.

2.3 CONDUIT FITTINGS

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

.2 Prefabricated L-fittings, to be installed where 90 ° elbows are required and there is insufficient space to meet the radius of curvature of the 90 ° elbow. This is valid for ducts of 27 mm and more.

.3 Steel fittings and connection sleeves, screw type for electrical metal tubes.

2.4 EXPANSION FITTINGS FOR RIGID DUCTS

.1 Weather-resistant expansion fittings, able to withstand a linear expansion of 200 mm, and ensuring continuity of the earthing network.

.2 Watertight expansion joints, capable of withstanding linear expansion and 21 mm deformation, and ensuring continuity of the earthing network.

.3 Weather-resistant expansion fittings allowing linear expansion of conduits at the entry of boxes.

2.5 FISH CORD

.1 Polyester pre-stretching rope with integral measurement, equal to Greenlee Measuring Tape N435 of approved equivalent.

.2 For optical fibre and Category 3 multipair cabling, use flat pull cord, 9.525 mm, having a minimum tensile strength of 220 lb. The rope shall include a 22 gauge tracer wire.

2.6 IDENTIFICATION

.1 Equipment identification to conform with section 26 05 53 – Electrical system identification.

2.7 ACCEPTABLE MANUFACTURERS

.1 EMT or rigid metal ducts:

- .1 Columbia-MBF.
- .2 RepubliConduit.
- .3 Wheatland.
- .4 Or approved equivalent.

.2 PVC conduits:

- .1 Canron
- .2 Columbia-MBF
- .3 Ipex
- .4 Panduit (Canada) Ltée
- .5 Or approved equivalent.

.3 Flexible conduit:

- .1 Anamet Canada.
- .2 Columbia-MBF.
- .3 Thomas & Betts.
- .4 Or approved equivalent.

.4 Expansion sleeves:

- .1 Crouse-Hinds
- .2 Eaton
- .3 O-Z/Gedney
- .4 Or approved equivalent.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

.1 Conduits indicated on plans are shown in schematic form only. Place exposed conduit such that the available vertical clearance of the space is not reduced. Before start of work, review location of conduits with Consultant.

.2 Parallel conductor conduit runs shall be of the same length.

.3 Arrange and allow for cutting and drilling of openings and other structural work necessary to install electrical conduits, cables, pull boxes and terminal boxes.

.4 Openings in walls and floors shall be approved by the Structural Engineering Consultant.

3.3 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Unless otherwise indicated, use galvanized, rigid, thin-walled steel conduits.

.4 Unless otherwise indicated, use galvanized and threaded rigid conduits:

- .1 Indoors in areas exposed to mechanical damage.
- .2 Indoors in explosion proof areas.
- .3 Indoors for installations with voltage greater than 750 V.

.5 Unless otherwise indicated, use rigid aluminum threaded conduits:

- .1 Outside, protruding.
- .2 Indoors for areas exposed to moisture, water and weather.

.6 Unless otherwise indicated, use galvanized steel conduits, flexible type, waterproof, with a maximum length of 900 mm between the conduit network and the unit's junction box:

- .1 For connecting motors.
- .2 For the connection of vibrating materials located in damp or wet rooms.
- .3 For the connection of vibrating materials located in a corrosive environment.

.7 AC90 (BX) or TECK90 flexible ducts are not acceptable. Flexible and watertight metal conduits must bear the identification "FT 4" and must not exceed 1500 mm in length.

.8 Use rigid unplasticized PVC ducts when installed in ventilation plenums.

.9 For PVC conduits 103 mm in diameter and over, provide long radius PVC elbows.

.10 Bend cold conduit.

- .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.11 Mechanically bend steel conduit over 21 mm diameter.

.12 The thread of rigid conduits, carried out on the site, must be of sufficient length to allow tight joints.

.13 Provide and install a pre-draw wire with indication of the length in all empty conduits of all systems, in all empty conduits for future planning in order to facilitate the pulling of wires and / or cables.

.14 From each panel installed flush, bring up to the ceiling void, two (2) reserve conduits of 41 mm.

- .1 The conduits must terminate in 305 mm x 305 mm x 102 mm junction boxes housed in the ceiling.

.15 Remove and replace blocked conduit sections.

.16 Do not use liquids to clean out conduits.

.17 Dry conduits out before installing wire.

.18 Under no circumstances should conduits touch sheath insulation or mechanical equipment or be buried in insulation or flame retardant materials. A minimum free space of 75 mm must be maintained between the ducts and any insulated steam pipe.

.19 No drilling is to be done through the beams for the passage of conduits.

.20 Unless otherwise indicated, conceal all conduits in walls, floors, ceilings and suspended ceilings.

.21 Maintain grounding continuity throughout the installation, taking care to make solid connections between the conduits and the equipment. A green ground wire must be added in each flexible conduit connecting a device likely to vibrate such as motors.

.22 The inner radius of curvature of the ducts is at least six times the internal diameter of the pipe. When a group of ducts run side by side, the bending radii are concentric.

.23 The internal radius of curvature of communications and security conduits must be at least six (6) times their internal diameter for conduits of 53 mm and less.

.24 The internal radius of curvature of communications and safety conduits must be equal to at least ten (10) times their internal diameter for conduits over 53 mm.

.25 Connect threaded conduits to boxes and devices using two (2) nuts and a threaded and insulated steel sleeve.

.26 Ream ends of rigid threaded conduits to remove metal burr. Carefully cut the threads and coat the joints with minimum or an equivalent product to ensure waterproofing. Keep the thread length to the minimum necessary for connections to boxes or other accessories.

.27 During construction, equip ducts with plugs to prevent foreign bodies from entering.

.28 Conduit raceways between two outputs, pull boxes or sliding sleeves must not have more than three 90° elbows or equivalent or be more than 60 m in length, except the external telephone network, where indicated in the plans.

.29 No section of communications and security conduit shall be more than 46 m in length or include more than two (2) 90° elbows or a total of radii of curvature greater than 180° between two (2) sliding sleeves or two (2) draw boxes.

.30 Attach conduits as follows:

- .1 Supply and install all the necessary supports galvanized for electrical work.
- .2 Conduits:
  - .1 When the insulated conduits are in contact with a surface of concrete or masonry, affix them using cast iron or steel straps.
  - .2 Where a group of passages (four or more) flows in parallel, affix them to the steel supports by anchoring them directly to the frame or by means of threaded rods or other supports.

.3 The size of the rods, supports, and spacing of supports are based on weight bearing as required by the code. When conduits of various sizes are grouped, the spacing of the supports is determined by the smallest conduit of the group.

.3 Install cross braces spaced up to 12 m center-to-center and longitudinal braces on all horizontal runs of suspended conduits to 300 mm of the ceiling tile. This requirement may be omitted if the maximum diameter is less than 65 mm for a conduit or if conduits of an individual group has a total weight less than 15 lb/m.

.31 Continuous threads are not permitted. When in some cases, it is not possible to install regular fittings, use Erikson type fittings.

.32 Support conduits suspended using galvanized brackets, as described elsewhere in this book.

.33 Use liquid tight waterproof conduit for connections to equipment in damp, wet or corrosive locations.

.34 The spacing of supports and fasteners must be in accordance with the latest edition of the Electrical Code of Québec.

.35 Support vertical conduits at floor level and use intermediate supports required by the Code.

.36 In suspended ceilings, support the metal sheath cables to the frame and not the ceiling structure.

.37 When a recessed panel is located in a room with a suspended ceiling, install three (3) empty ducts 21 mm in diameter between the panel and the inside of the upper suspended ceiling and three (3) other 21 mm ducts between the panel and the suspended ceiling of the lower level. These conduits must be easily accessible for future extension.

3.4 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

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

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

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

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

3.5 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings or in concrete slabs.

3.6 PIERCINGS AND SLEEVES

.1 In the event that the drilling of a floor is carried out after pouring, place in the hole the appropriate sleeve with three (3) support studs which prevent it from slipping in the hole. Seal the space between it and the concrete watertight with a suitable and approved product.

.2 If it is impossible or negligent to supply and install these sleeves, inserts, frames in time or if they are not precisely located, assume the cost of the drilling and the following repairs.

.3 Consult the structural construction professional before carrying out drilling of floors, walls and ceilings, beams or any other part of the structure and obtain permission.

.4 Unless otherwise indicated on the plans, all drillings and openings of 150 mm in diameter and less will be carried out by the Contractor and coordinated with the Builder Manager and the Structural Construction Professional. Larger piercings or openings will be carried out by another Contractor.

.5 Provide all openings for the passage of conduits or gutters, so as to allow expansion, contraction or insulation, as the case may be. In the case of an opening on the roof, take all the necessary precautions to ensure that it is watertight. Supply and install all steel supports necessary for the installation of equipment, conduits, etc.

.6 The Contractor is responsible for damage to existing hidden services (conduits / electrical and telecommunications wiring, piping, structure or others) during the holes required for this work. Perform all the checks required to prevent deterioration of existing services. To this end:

- .1 Consult the existing plans (if available).
- .2 Consult the Owner and the technical personnel having knowledge of the premises.
- .3 Make small openings to ensure that major openings are located between the rebars and that they are not cut. Space the holes approximately 150 mm.

.7 The Contractor for each section will be responsible for locating and supplying all the sleeves necessary for the execution of this work, in accordance with the previous paragraph.

.8 Locate, supply and install bushings for conduits at the following locations:

- .1 Foundation wall and slab on grade: "Link Seal" type sleeves, including a steel sleeve with sealing collar attached to the sleeve by welding, and compressible rubber rings. Dimensions of the sleeves according to the diameter of the conduits.
- .2 Floors (other than slab on ground): galvanized steel sleeves. Leave an annular free space of 6 mm between the sleeve and the duct or between the sleeve and the insulation.
  - .1 Obstruct the annular space between the piping and the sleeve (or between the insulation and the sleeve) with a fire-resistant sealant: RTV silicone foam, such as Dow Corning or Flame Safe from Thomas & Betts or approved equivalent.

.2 In the mechanical, electrical and telecommunications rooms, another Contractor must pour a concrete base 150 mm thick and extending beyond the sleeve by 50 mm.

.3 Masonry or gypsum walls: galvanized steel sleeves. Leave an annular free space of 6 mm between the sleeve and the piping or between the sleeve and the insulation. Install the sleeves so that they are flush with the surfaces of the walls. Seal the annulus between the conduit and the sleeve (or between the insulation and the sleeve) with a fire-resistant sealant: Dow Corning RTV Silicone Foam, or Thomas & Betts Flame Safe or approved equivalent. Another Contractor must supply and install the lintels and / or reinforcements of the openings (if their size requires it) and obstruct the space between the sleeve and the opening with a material compatible with that of the wall crossed.

3.7 PULL CORDS

.1 Contractor to supply a flat tracking cord to ensure correct placement when installing fiber optic cables in new conduits or when pulling fiber optic cables and category 3 multipair cables in existing conduits.

.2 The pull cord must be installed inside the fiber conduit at the same time as the cable pull. When a conduit enters pull box or an access shaft, the Contractor shall enter the rope and leave a minimum length of 2 m inside the shaft and secure it near the cover.

.3 Provide a fish cord in empty conduits.

APPENDIX

MAXIMUM NUMBER OF CATEGORY 6 AND 6A CABLES PER CONDUIT									
Cables	Duct size in mm								
	16	21	27	35	41	53	63	78	103
Category 6 FT4	---	3	6	10	14	23	34	52	90
Category 6A FT4	---	2	3	6	8	14	20	30	53
Note: for dimensions not indicated, follow chapter V - Electricity of the Quebec Construction Code (Quebec Electricity Code).									

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3.7 ON-SITE QUALITY CONTROL

Part 1 General

1.1 SUMMARY

.1 This section includes:

.1 Design, supply and installation of complete SRS for all systems, equipment specified for installation on this project. This includes UPS systems, electrical light fixtures, transformers, MCC's, diesel generators, fire protection, conduit, communications, electrical equipment and systems, both vibration isolated and statically supported.

1.2 REFERENCES

.1 Unless otherwise indicated, the seismic restraint system should be designed and selected to meet the requirements of the latest edition of:

.1 Building Code of Québec.

.2 Association canadienne de normalisation (CSA/CSA International).

.3 National Fire Protection Association.

.4 FM Global.

.5 ASHRAE – Practical Guide to Seismic Restraint.

.6 SMACNA – Seismic Restraint Manual Guidelines for Mechanical Systems.

.2 Seismic zone as follows: Brossard: $S_a(0.2) = 0.58$.

.3 The acceleration factor of the location, F, to be considered in the calculations from the data transmitted by the engineering structure which is related to the soil profile (location category). As part of this project: the location category is E.

.4 Seismic risk coefficient, I_E:

.1 Electrical conduits anchored directly (rigid fasteners) to the structure: emergency preparedness: $I_E = 1.5$.

.5 If the value $S_a(0.2)$ is less than 0.12, seismic measurements can be omitted.

.6 Other coefficients (Cp, Ar, Ax, Rp) according to the Building Code of Québec.

.7 For non-ductile assemblies, adhesives or compressive cartridge fixings, Rp value is 1.0.

.8 Superficial anchors, chemicals, epoxy resin or anchors embedded, the Rp value is 1.5 if the embedding length / diameter ratio is less than 8.

.9 Cartridge fasteners and simply placed anchors should not be used as an anchor to resist pull loads.

.10 Electrical conduits supported by vibration isolators (flexible mountings): I = 1.5.

.11 Equipment and devices anchored directly (rigid attachments) on vibration isolators (flexible fasteners) to the frame: I = 1.5.

.12 Presenting a complete dynamic analysis of systems and equipment referred to above, provide details of the maximum forces applied to the material and make recommendations for changes or additions to support structures to maintain the equipment in good operating condition.

.13 In general:

.1 Montreal:

.1 For I_E = 1.5

Description	Location Category	Lateral Force (g)		
		Ground Level	Mid-height	Roof
Electric cable paths, busbar ducts, conduits (CCQ-2010, No. 17 Table 4.1.8.18).	A	0.11	0.22	0.33
Rigid components with ductile materials or non-ductile assemblies (CCQ-2010, No. 19 Table 4.1.8.18).	A	0.22	0.44	0.65
Machinery, accessories, equipment, conduits and reservoirs (with contents) (rigid, rigid and flexible assembly, flexible assembly) (CCQ-2010, Table No. 11 4.1.8.18).	A	0.22	0.44	0.65
Electric cable paths, busbar ducts, conduits (CCQ-2010, No. 17 Table 4.1.8.18).	B	0.12	0.25	0.37
Rigid components with ductile materials or non-ductile assemblies (CCQ-2010, No. 19 Table 4.1.8.18).	B	0.25	0.49	0.74
Machinery, accessories, equipment, conduits and reservoirs (with contents) (rigid, rigid and flexible assembly, flexible assembly) (CCQ-2010, Table No. 11 4.1.8.18).	B	0.25	0.49	0.74
Electric cable paths, busbar ducts, conduits (CCQ-2010, No. 17 Table 4.1.8.18).	C	0.14	0.29	0.43
Rigid components with ductile materials or non-ductile assemblies (CCQ-2010, No. 19 Table 4.1.8.18).	C	0.29	0.58	0.86
Machinery, accessories, equipment, conduits and reservoirs (with contents) (rigid, rigid and flexible assembly, flexible assembly) (CCQ-2010, Table No. 11 4.1.8.18).	C	0.29	0.58	0.86
Paths of electric cables, busbar duct, conduits (CCQ-2010No. 17 Table 4.1.8.18).	D	0.16	0.33	0.49
Rigid components with ductile materials or non-ductile assemblies (CCQ-2010, No. 19 Table 4.1.8.18).	D	0.33	0.66	0.99
Machinery, accessories, equipment, conduits and reservoirs (with contents) (rigid, rigid and flexible assembly, flexible assembly) (CCQ-2010, Table No. 11 4.1.8.18).	D	0.33	0.66	0.99
Paths of electric cables, busbar ducts, conduits (CCQ-2010, No. 17 Table 4.1.8.18).	E	0.16	0.33	0.49
Rigid components with ductile materials or non-ductile assemblies (CCQ-2010, No. 19 Table 4.1.8.18).	E	0.33	0.66	0.99
Machinery, accessories, equipment, conduits and reservoirs (with contents) (rigid, rigid and flexible assembly, flexible assembly) (CCQ-2010, Table No. 11 4.1.8.18).	E	0.33	0.66	0.99

1.3 CALCULATIONS

.1 The Engineer specializing in seismic design must obtain electrical plans and specifications, all information relating to equipment, including electrical conduits required for the calculation of seismic measurements (weight, number, raceway type, spacing between supports, groupings on trapezoidal supports).

.2 The Engineer specializing in seismic design must obtain from each device manufacturer, the characteristics required in Article "SHOP DRAWINGS" in Section 20 00 10 (weight, location of the center of gravity, number of fixing points, the center of gravity location of fixing points, speed, seismic fragility of the internal components, etc.).

.3 The Engineer specializing in seismic design must verify all calculation parameters, calculations, and installation details of the anchor bolts and seismic restraint measures.

.4 For vertical loads or equipment at risk of inversion, use the detailed equations in FEMA standard 450-1.

.5 Provide for information the earthquake engineering design report, the parameters or values used in compliance with the Building Code of Québec, the basis of calculations, data equipment or systems analyzed, calculations for seismic braces and inversion, overturning moments, anchor calculations, recommendations, measures and installation details for each system, piece of equipment, and device installed. Provide plans indicating measurements and sketches for each device, along with product specifications.

.6 In the event that the weight of equipment/tank and its contents have a mass greater than 10% of the mass of the floor, seismic forces will be subject to rational analysis.

.7 Confirm by calculations that if rigid braces are installed, no undue force will be applied to the supports.

.8 See the article "SEISMIC STANDARDS".

1.4 CHARACTERISTICS OF PARASISMIC PROTECTION SYSTEMS

.1 Seismic protection systems must be perfectly integrated and compatible with the following:

.1 Acoustic and vibration of prescribed devices.

.2 Building design features, as well as electrical and mechanical installations.

.2 It is not necessary that all hardware and operating systems remain protected during and after an earthquake, except those listed in the article "SEISMIC STANDARDS", which must remain operational during and after a disaster. During an earthquake, seismic protection devices and systems are used to prevent materials and equipment from moving, falling or tipping over, which could injure the occupants.

.3 The design of seismic protection devices and systems should be done by an engineer specialized in the field of seismic engineering and recognized in the province of Quebec. At the end of the work, an inspection will be made by the latter and a compliance report will be produced to the Owner through the Professional.

1.5 INFORMATION/DOCUMENTS/SAMPLE SUBMITTALS

.1 Submit documents and samples required in accordance with section 20 00 10. Mechanical and electrical general instructions.

.2 Submit a design report for each electromechanical system, including:

.1 The name and number of the project as it appears on the plans and specifications.

.2 The name of the electromechanical system to which the report applies.

.3 The design criteria for the seismic protection system of the electromechanical system, including:

.1 The project location.

.2 The value of $S_a(0.2)$, as given in the CCQ, for the location of the project.

.3 The project location category based on the seismic response for the location.

.4 The value of Fa as a function of the location category and the value of $S_a(0.2)$.

.5 The building risk category.

.6 The risk coefficient for loads and effects due to earthquakes I_E.

.7 The height hn of the building above the ground.

.8 The technical components of the electromechanical system exempted, and the reason for the exemption.

.9 List of all technical components of the electromechanical system that must be protected against seismic loads.

.4 Calculations of the seismic loads created by the seismic stresses of all required technical components, showing:

.1 The identification of the technical component, as it appears on the plans and specifications.

.2 The location of the technical component, including its height h_x.

.3 The type of technical component (example: heat pump, heat exchanger, etc.).

.4 The manufacturer's model.

.5 The weight of the technical component and its coefficients C_p, A_r and R_p.

.6 The calculated lateral design load V_p of the technical component.

.7 Loads on the building structure.

.5 Equipment overturn calculations for ground, slab, or rooftop base, showing:

.1 The dimensions of the technical component, including the length L, the width or depth P, the height H and the center of gravity h_{cg}.

.2 Overturning moments.

.3 Moments resistant to overturning.

.6 The means of countering the calculated seismic stresses, including:

.1 The method for resisting seismic stresses.

.2 A sketch showing the planned installation to mitigate seismic loads.

.3 Plans showing the location and type of longitudinal, transverse, as well as longitudinal and transverse seismic restraints.

.4 Specification of acceptable products for each part that will be used for seismic protection, including anchors, bolts and nuts, aircraft cables and other equipment.

.7 The signature of the Engineer who produced the design report and his membership number with the Order of Engineers of Quebec, his professional address, his telephone number and his email address.

.3 At the completion of work, have the structure inspected and submit a compliance report for each electromechanical system, including:

.1 The project title and number as it appears in the specifications.

.2 The discipline to which the report applies.

.3 The title of the design standard report against which compliance is analyzed.

.4 The analysis of the seismic restraint of each technical component for which the design report required seismic protection.

.5 Photos showing the seismic restraint system applied to each technical component.

.6 A conclusion that the seismic restraint system installed meets the requirements of the design report and the reference codes and standards.

.7 The signature of the Engineer who produced the design report and his membership number with the Ordre des ingénieurs du Québec, his professional address, his telephone number and his email address.

.8 The certificate waiving all claims of ownership and copyright to models, diagrams, working drawings, details and specifications in favor of the Owner.

.4 Submit to the Framing Professional, for examination, the points of connection of the seismic restraint devices and systems to the building frame. Provide shop drawings and technical data sheets.

Part 2 Product

2.1 GENERAL

.1 The Professional in the design of the earthquake protection system must ensure that the components of the earthquake protection system provided by the Contractor meet the requirements of his design report.

.2 Seismic restraint systems must be compatible with the electrical and structural design of the building. They must not impede the normal operation of mechanical and electrical systems. They must be designed and installed to withstand calculated acceleration forces.

.3 In attached buildings, seismic measures must be designed to accept a multiplicative factor of two times the movement of the expansion joints, as calculated by the structural Engineer.

.4 Any equipment braced or not required to be braced, must not cause harm to an essential distribution system.

.5 Seismic measures should be able, in an earthquake, to prevent permanent shifts in all directions caused by lateral movement, ascent or rocking.

.6 The Consultant specializing in seismic measures must validate vibration isolators, integrated and separated seismic dampers, the cable fastening and restraint systems from other manufacturers that regularly produce the same material, in agreement with the proposed installation of the relevant section.

.7 Seismic protection systems must be able to oppose the applied forces in all directions.

.8 Fasteners and connection joints must withstand the same maximum loads as the seismic restraining devices.

.9 For longitudinal braces, the conduit must be attached to the conduit.

.10 Depending on the type of service and its manufacturing material, the position and quantity of bracing must consider the shift length, maximum permissible ("offset") according to the forces involved throughout the course of the distribution.

.11 Seismic fasteners installed on conduit systems and cable trays must be compatible with the requirements of anchors and guides for the conduit systems and cable trays.

.12 Do not add rigid seismic restraints to existing electrical conduits supports without checking the ability of these supports to withstand the increased forces.

.13 Provide resistant expanding mechanical anchors to secure seismic restraints to concrete structures. Cartridge fasteners and anchors simply placed must not be used for loads under tension. The use of anchors and fasteners by nail gun is prohibited.

.14 The use of cast iron supports or those made of threaded pipes or other brittle materials is prohibited.

.15 Seismic restraint devices installed on conduit systems and related fasteners attached to electrical equipment must be compatible with the vibration and anti-seismic devices for these components.

.16 Seismic restraint devices must not interfere with the operation of fire devices or compromise their integrity.

.17 Vertical supports, including vibration isolators, should in no way develop reverse forces during normal operation of the system or equipment.

.18 Mounted services must include seismic measures and follow the recommendations contained in this discipline.

.19 When required, to prevent buckling, stiffeners on suspension rods to be added.

.20 For buildings $I_E = 1.5$: accessories such as diffusers and lighting fixtures installed in suspended ceilings, must be stabilized everywhere, including the exit corridors.

2.2 CONDUITS AND ELECTRICAL CABLE SHELVES

.1 Electrical conduit supports must withstand all static and dynamic conditions, including:

.1 The weight of the conduit, accessories, and internal wires.

.2 Inclement weather, such as ice, wind, and seismic forces.

.2 Conduit shall be provided with longitudinal and transverse bracing. They can be rigid or flexible types (cable). At the same bracing, always use identical spacers (do not use a spacer with a stiff wire), as per the installation diagrams in SMACNA.

.3 Seismic measures will be based on the recommendations of Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

.1 Seismic Restraint Manual Guidelines for Mechanical Systems – SMACNA

.2 Appendix E – Seismic Restraint Manual Guidelines for Mechanical Systems – Addendum SMACNA.

.4 Use one or more of the following methods depending on the installation conditions:

.1 Fasten conduits securely to the frame.

.2 Strengthen conduit in all directions.

.3 Strengthen attachment points to the conduit frame.

.4 Fasten conduit with bracing. Fixing of conduits by bracing prevents oscillation in the horizontal plane, swinging in the vertical plane, and the sliding and buckling in the axial direction.

.5 Seismic bracing may be omitted:

.1 Electrical conduits individually suspended, the length between the top of the conduit and the anchorage is 300 mm (12") or less. If the installation is made on a trapeze, the permissible length of 300 mm (12") is located between the bottom of the trapezoid and the anchor.

.2 Electrical conduits less than 65 mm (2½") in diameter. If electrical conduits of 65 mm are installed on the trapezoids and the total weight is less than the weight of the pipe or the equivalent of 14.9 kg/m (10 lb/in).

.6 Maximum spacing between seismic bracing shall be as follows, unless otherwise specified in the various tables (see Tables of SMACNA):

Description	Electrical Conduit	
	Transversal	Longitudinal
0.25 g	15.2 m (50')	24.4 m (80')
0.5 g	12.2 m (40')	24.4 m (80')
1.0 g	12.2 m (40')	24.4 m (80')
2.0 g	6.1 m (20')	12.2 m (40')

.7 Cross bracing must be installed at each end if the conduit length is less than the allowed distance. Cross bracing must be installed at each elbow and at each end of a segment. The minimum number is two per length of conduit.

.8 When conduits pass through a seismic joint or a building expansion joint or the pipeline is connected to a device based on vibration isolators, flexible joints must be installed multi-directionally.

.9 A rigid conduit must not be anchored to a structure or part of the building that responds differently to earthquakes.

.10 Raised pipes must be supported laterally at each floor (see details SMACNA).

2.3 DEVICES WITH VIBRATION ISOLATORS

.1 Surfaces must withstand all static and dynamic conditions, including:

- .1 Their weight with accessories, insulation and internal fluids.
- .2 Forces imposed by the thermal stress of expansion and contraction.
- .3 Reactions during starts and stops.
- .4 Vibration.
- .5 In general, other occasional conditions, such as ice, wind and seismic forces.

.2 These devices must be securely anchored to the building structure to prevent tipping or sliding:

- .1 Apply one or more methods, depending on the location conditions.
  - .1 Use anti-vibration devices with integrated damping systems.
  - .2 Use dampers separated into more anti-vibration devices.
  - .3 Use a damping system made of a compound of structural elements and an elastomeric material, with the approval of the Engineer.

.3 Damping effect exerted due to an elastomeric material or other means must be smooth and regular so as to prevent high impact loads.

.4 Seismic measures should not interfere with vibration isolators. They must not operate in case of earthquake and will not cause any overturning.

.5 Each device must have at least four seismic dampers installed as close as possible near the corners of the device.

.6 Each type of seismic shock must have the following characteristics:

- .1 The impact surface must be high quality, un-cemented, elastomeric, in place for ease of replacement.
- .2 Resilient material must be easily accessible for inspection and replacement in the case of damage.
- .3 The assembly must reduce movement in all directions.
- .4 Dampers must be tested by independent laboratories and certified by a registered Engineer in this discipline.
- .5 In general, a maximum spacing of 6 mm (¼") between the unit and the seismic shock.

.7 Piping, conduit, and devices supported with vibration isolators:

- .1 To avoid transmitting the vibrations normally by rigid bracing, these components have suspended cables relaxed, galvanized steel or stainless steel, see F-type seismic dampers.
- .2 Seismic equipment fasteners must have the characteristics described for pipes and ventilation ducts without vibration isolators.

.8 Types of seismic shock:

.1 In general, seismic shock absorbers will be integrated with vibration isolators. When seismic forces are too high or when vibration isolators are existing, they must be separate.

.2 Description:

Type A — Separate omnidirectional absorber consisting of a molded element replaceable neoprene 3/16" minimum thickness, maximum capacity of 1 000 lb/in² minimum clearance of 1/8", minimum of two bolts, similar to the model No. Z 1225 by Mason.

Type B — Separate omnidirectional absorber consisting of a molded member replaceable neoprene ¾" minimum thickness, maximum capacity of 1 000 lb/in², clear 1/8" to ¼" maximum, minimum number of two bolts, similar to model No. Z-1011 by Mason.

Type C — Integrated omnidirectional absorber comprised of one or more springs shock with neoprene linings, placed inside of a housing ductile iron (gray cast iron housings cast are not accepted), minimum clearance ¼" minimum number of two bolts, similar to SLR models SSLFH by Mason.

Type D — Integrated omnidirectional damper composed of two molded elements replaceable neoprene placed inside a housing ductile iron minimum number of six bolts, similar to BR model by Mason.

Type E — Integrated omnidirectional damper for guiding or anchoring the riser pipes consisting of two steel tubes separated by ½" 60 durometer neoprene, load capacity of 500 lb/in², anchor plate to the base using two bolts, similar to the model ADAH by Mason.

Type F — Aircraft type, pre-stressed cable in galvanized steel or stainless steel, complete with the appropriate hardware (fasteners at the ends, assembly lugs, etc.), similar to the SCR model Vibron Mountings & Controls. Use a multiplication factor of 2 if it is of SCR model.

Type G — Hoses, rubber, spherical expansion with several layers of nylon, capable of withstanding 250 lb/in² at 170°F and 165 lb/in² at 250°F, fitting similar right to MFTNC model and 90° fitting similar to MFNEC model by Mason.

Type H — Steel platform suspended with steel frame, able to withstand seismic forces imposed by the weight of the equipment.

Type K — Separate shock absorber composed of framing elements and neoprene cushions, minimum number of two bolts, similar to Kinetics KSS model (Vibro Acoustics).

Type L — Separate shock absorber consisting of two neoprene sleeves and two steel washers, allowing the bolt to anchor the metal panels to the surface on a wall, similar to Mason's PB model.

2.4 LIST OF MANUFACTURERS

.1 Stiffeners on suspension rods:

.1 B-Line (Cooper Industries)

.2 Mason Industries Inc. (Tecoustics Ltd, Oakville, Ontario)

.3 Power-Strut by Grinnell

.4 Unistrut (Routleco Inc.)

.5 Vibro-Acoustics, Vibration Mountings & Controls Inc. Korfund Dynamics Co. Inc. (Racan).

.6 Vibron Ltd, Kinetics Noise Control (Patrick Garneau & Associates Inc.)

.7 Or approved equivalent

.2 Supports mechanical pipes and electrical conduits without vibration isolators:

.1 B-Line (Cooper Industries)

.2 Mason Industries Inc. (Tecoustics Ltd, Oakville, Ontario)

.3 Power-Strut by Grinnell

.4 Unistrut (Routleco Inc.)

.5 Vibro-Acoustics, Vibration Mountings & Controls Inc. Korfund Dynamics Co. Inc. (Racan).

.6 Vibron Ltd, Kinetics Noise Control (Patrick Garneau & Associates Inc.)

.7 Or approved equivalent

.3 Seismic dampers:

.1 B-Line (Cooper Industries)

.2 Mason Industries Inc. (Tecoustics Ltd, Oakville, Ontario)

.3 Novibra

.4 Vibro-Acoustics, Vibration Mountings & Controls Inc. Korfund Dynamics Co. Inc. (Racan).

.5 Vibron Ltd, Kinetics Noise Control (Patrick Garneau & Associates Inc.)

.6 Or approved equivalent

.4 Steel Structures external to certain equipment cabinets:

.1 B-Line (Cooper Industries)

.2 Power-Strut by Grinnell

.3 Unistrut (Routleco Inc.)

.4 Or approved equivalent

Part 3 Execution

3.1 GENERAL

.1 The seismic protection system design Engineer must ensure that the installation of the seismic restraint system by the Contractor meets the requirements of his design report.

3.2 MANUFACTURER INSTRUCTIONS

.1 Compliance: comply with requirements, recommendations and manufacturer's written data, including product technical bulletins, instructions for handling, storage and product installation, and technical information sheets.

3.3 INSTALLATION CRITERIA FOR SEISMIC DEVICES

.1 Seismic devices must not interfere with the normal functioning of the building or its technical components.

.2 Diffusers in dropped ceilings of exit corridors must be anchored to the suspended ceiling or to the building structure.

.3 Fixtures in dropped ceilings shall be secured to the structure with 16 gauge aircraft cable or 12 gauge steel wire at least at two (2) opposite corners.

.4 Any pendant type luminaire must be restrained to the structure by means of a flexible attachment - cable or steel wire - having an allowable load of at least two (2) times the weight of the luminaire. In addition, the luminaire must be able to oscillate through 45 ° without the risk of touching anything.

.5 If the dropped ceiling is seismic certified, luminaires weighing less than 9 kg can be attached to the structure of the suspended ceiling bars instead of directly to the building structure.

3.4 INSTALLATION

.1 Install the seismic fasteners for each electromechanical system as described in the design report.

.2 Seismic protection devices must not be anchored to two (2) different structures, such as a wall and a ceiling, and they cannot be attached to another component.

.3 Seismic bracing must be located near the supports (maximum distance of 100 mm (4 ")) for piping, ventilation ducts or electrical conduits.

.4 Fastening devices and bonding points:

.1 Ensure that the bonding points and fixing devices can withstand the same maximum loads of devices and seismic protection systems in all directions.

.5 Restraining cables:

.1 Connect restraining wire to suspended fixtures so that their axial impact corresponds to the center of gravity of the equipment.

.2 Use wire passes, spades and other appropriate hardware parts to ensure alignment of seismic devices and systems and to prevent the cables from bending at bonding points.

.3 In the case of piping systems, install the transversal retaining cables at intervals of not more than 10 m and the longitudinal wires at intervals not exceeding 20 m or according to the limits imposed by their performance characteristics or those of the anchors.

.4 For purposes of seismic protection, small diameter pipes may be connected to larger diameter pipes; however, the opposite practice is not permitted.

.5 In the case of equipment hanging from the ceiling, ensure an angle of 90° in the restraint cables relative to each other (in the plane), and attach them to the building frame at a 45° angle.

.6 Adjust the tension of the cables so they do not appear loose but ensure they do not impede the normal operation of anti-vibration devices.

.7 Tighten the cables in order to reduce slack, 40 mm under thumb pressure. Under normal operating conditions, the cables must not support the weight of the restrained equipment.

.6 Install seismic devices and systems at least 25 mm from any machinery or any utility line.

.7 Isolating Miscellaneous equipment against vibration:

.1 Bolt the equipment to the mounting base and then to the building frame with the aid of through anchor bolts.

.8 Coordinate operations with the other trades involved.

3.5 TRAINING REQUIREMENTS FOR THE INSTALLATION CONTRACTOR

.1 The seismic protection system design Engineer is responsible for ensuring that the Contractor and his staff have the required skills and have received the necessary training to carry out the installation of the seismic system that meets the requirements of the design report.

.2 The seismic protection system design Engineer must ensure that the Contractor and his staff take into account the following issues:

.1 The thermal expansion and contraction of piping.

.2 The vibration of technical components.

.3 The springs and shock absorbers used to support technical components.

.4 Protection of the waterproof roof membrane.

3.6 FREE SPACING

.1 All seismic measurements should be verified after the mechanical and electrical systems have been switched on to ensure that the recommended free spacings are obtained. No more than recommended, as the fragility of the unit may be affected. Make adjustments where required. Be sure that the seismic restraints do not cause short circuits with vibration isolators.

.2 A minimum clearance of 25 mm (1") must be provided between the seismic protection devices, other equipment, and service elements.

3.7 ON-SITE QUALITY CONTROL

.1 Inspection and certification of earthquake protection devices and systems:

.1 Once the installation work is completed, the seismic protection devices and systems must be checked by the Professional designer.

.2 Submit the compliance report by component once the deficiencies have been corrected (if applicable).

.2 Documents required for commissioning:

.1 The compliance report must be submitted to the Professional before the system is put into service.

.2 Once the certification is completed and the report accepted, submit a complete copy of the project file reviewed and annotated in order to show the as-built conditions.

END OF SECTION

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Part 1 General

1.1 SUMMARY

.1 This section includes:

.1 The general requirements for the identification of electrical equipment.

1.2 LABELS AND NAMEPLATES

.1 Use the identifications for devices as indicated on plans.

1.3 ACTION AND INFORMATION SUBMITTALS

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Shop drawings: nameplates for electrical equipment.

1.4 DOCUMENTS/ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents/elements, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Product

2.1 EQUIPMENT IDENTIFICATION

.1 Fabrication:

.1 General characteristics: 3 mm thick plastic lamicoids, with square corners, lettering accurately aligned and machine engraved into core.

.2 Sizes as follows:

Nameplate Sizes	Dimensions (L x H)	Dimensions: lettering height in mm or Arial font sizing			
		First Line	Second Line	Third Line	Fourth Line
1	300 mm x 100 mm	8 (30)	22 (80)	10 (36)	---
2	150 mm x 50 mm	6.5 (24)	13 (50)	6.5 (24)	---
3	100 mm x 30 mm	4.5 (16)	8 (30)	4.5 (16)	---
4	100 mm x 40 mm	4.5 (16)	8 (30)	5.5 (20)	4.5 (16)
5	75 mm x 35 mm	3 (12)	6 (22)	3 (12)	---
6	75 mm x 20 mm	6 (24)	3 (12)	---	---
7	50 mm x 10 mm	3 (12)	---	---	---

.3 Colours:

Types	Lettering	Background
Normal "N "	Black	White
Conditional emergency power	White	Red
Emergency – Personal security	Red	White
Emergency – Delay	Blue	Yellow
UPS power	White	Blue

2.2 OUTLET AND SWITCH IDENTIFICATION

.1 Materials:

.1 Normal power: "P-Touch" type labels or approved equivalent. Size 9 mm with black lettering on white tape.

.2 Emergency power: "P-Touch" type labels or approved equivalent. Size 9 mm with red lettering on white tape.

2.3 IDENTIFICATION OF EMERGENCY LIGHTING EQUIPMENT

.1 Materials:

.1 Identify all lighting devices connected to the emergency room with a red sticker 6 mm in diameter with a plasticized finish resistant to cleaning.

2.4 ELECTRICAL EQUIPMENT IDENTIFICATION

.1 Materials:

.1 Normal power: "P-Touch" type labels or approved equivalent. Size 12 mm with black lettering on white tape.

.2 Emergency power: "P-Touch" type labels or approved equivalent. Size 12 mm with red lettering on white tape.

.3 UPS power: "P-Touch" type labels or approved equivalent. Size 12mm with blue lettering on white tape.

2.5 IDENTIFICATION FOR FIRE ALARM

.1 Materials:

.1 "P-Touch" type tape or equivalent approved transparent 12 mm wide with black lettering.

2.6 UNILINGUAL IDENTIFICATION

.1 The labels used to identify the systems and elements must be written in French.

Part 3 Execution

3.1 GENERAL REQUIREMENTS

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

.2 The procedure for identifying equipment numbers is provided in the legend.

.3 Circuit identification must be installed from each device and / or outlet, up to the supply power source.

.4 Circuit numbers must be marked on all junction box covers using a black felt-tip pen.

3.2 NAMEPLATE LOCATIONS

.1 Nameplates must clearly identify devices and must be located such that they will be visible and legible from the work floor.

.2 Do not apply paint or heat insulation to nameplates.

3.3 OUTLETS, SWITCHES AND ELECTRICAL DEVICES

.1 Provide identification labels on all receptacle plates, switches and other similar devices.

.2 Install tape across the width of the plate and turn the tape to the inside on each side of the plate.

.3 Write circuit numbers on the inside of all outlet boxes and switches. Use white tape and secure it to the wiring inside the box.

.4 The circuit number must be identified in full and include the distribution panel number followed by the circuit number.

3.4 ELECTRICAL EQUIPMENT

.1 Information to include on nameplates:

Equipment	Format	First Line	Second line	Third line	Fourth line
Start	6	Equipment no. fed	Room	---	---
Distribution panel (DP)	3	Source (local) (*)	Equipment No.	Voltage, prot. upstream	---
Start	6	Supplied equipment number	If TX, supplied panel, room	---	---
Source no. 1	6	Source (room) (*)			
Source no. 2	6	Source (room) (*)			
Junction panel (P)	3	Source (local) (*)	Equipment No.		

Equipment	Format	First Line	Second line	Third line	Fourth line
Safety switch without fuse (SW)	5	Source	Equipment No.	(local), W.F. Amperage	
Safety switch with fuses (SW)	5	Source	Equipment No.	Amperage fuses	
(*) Only if the source is not in the same room.					

3.5 LIGHTING DEVICES

.1 Identify all lighting devices connected to the emergency room with a red sticker 6 mm in diameter with a plasticized finish resistant to cleaning.

3.6 FIRE ALARM

.1 Write on the base of each smoke and heat detector, its address, as well as on each manual station, relay module, module one (1) input or two (2) inputs, isolator module, and any other module or equipment addressable.

3.7 EXISTING SYSTEMS

.1 With a black marker, write circuit numbers on all junction boxes of existing circuits to be kept or relocated.

.2 When circuit wiring is removed up to a junction box, write on the box the number of the circuit with the inscription "RESERVED".

3.8 WIRING DESIGNATIONS

.1 Conductors to be identified by the CSA C22.10-2007 colour codes.

.2 In each fire alarm panel and in all junction boxes, each conductor will be identified by the circuit and loop number and an Electrovert Type Z identifier or approved equivalent suitable for the size of the wire; or by a sticker made from a printer designed for this purpose.

3.9 CONDUIT, BOX AND CABLE DESIGNATIONS

.1 Color code of metal conduits, pre-painted by the conduit manufacturer:

Systems	Conduits colours
Emergency 600 V	Black
Emergency 120/208 V, 120/240 V	Orange
Normal 600 V	Green
Normal 120/208 V	Violet
Fire alarm	Red
Building control (GBM), grounding	Galvanized natural

.2 Add to the colour mark of the metal conduits a secondary colour marked with a 19 mm plastic tape coloured according to the colour codes indicated in the following table:

Secondary colours	
Ground	Green
Isolated ground	Green and yellow

.1 Apply color markings (plastic tape) to cables or conduits at the points where they enter a wall, ceiling or floor, electrical / mechanical room, and at each box and piece of equipment.

.3 Permanently and indelibly mark with colored plastic tape the conductors for each power circuit. The Contractor must identify the phases according to the colour codes indicated in the following table:

Building conductor colour codes	
Phase A	Red
Phase B	Black
Phase C	Blue
Neutral	White
Ground	Green
Isolated ground	Green and yellow

.1 On the visible face of box covers, indicate the circuit numbers and the name of the panel, or its function. Use a "P-Touch" type sticker or approved equivalent.

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Part 1 General

1.1 SUMMARY

.1 Section content:

.1 This section covers wiring devices and related installation methods.

1.2 REFERENCES

.1 CSA International:

.1 CSA C22.2 no 42 – General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CAN / CSA no 42.1 - Cover plates for flush wiring devices (binational standard with UL 514D).

.3 CSA C22.2 No 111 - General purpose snap action switches (binational standard with UL 20).

1.3 DOCUMENTS TO BE SUBMITTED FOR APPROVAL / INFORMATION

Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.1 Shop drawings:

.1 Without limitation, shop drawings are required for the following items:

.1 Power outlets.

.2 Cover plates.

.3 Switch.

.4 Dimmer.

1.4 DOCUMENTS / ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

1.5 COLOUR CODE

.1 Assigning a color code to the sockets and switches:

.1 Normal network : white

.2 Emergency network for public safety : red

.3 Emergency network for emergency loads : red

.4 Static uninterruptible power supply network : blue

Part 2 Product

2.1 SWITCHES

.1 Switches: 120 V, single pole, three (3), four (4) way.

.2 Switches: manually operated general purpose, c.a., with the following characteristics:

.1 Connection Ports: wire size 10 AWG.

.2 Contacts: silver alloy.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.3 Switches of one manufacturer throughout project.

.4 For quality "Specifications Grade", refer to the following models:

Description	120 V Decora	347 V Decora
Unipolar switches:		
– For circuits at 15 A:	5691-2	5691-C
– For circuits at 20 A:	5621-2	5621-C
Shunt switches:		
– For circuits at 15 A:	5693-2	5693-C
– For circuits at 20 A:	5623-2	5623-C

.5 Use numbered switches from the company Leviton, unless otherwise stated.

2.2 LIGHTING DIMMERS

.1 Sliding linear dimmers:

.1 Dimmer with 0-10 V linear slider, Lutron DIVA series, with accessories required for the load to be controlled.

.2 Provide light-emitting diode (LED) dimmers compatible with lighting devices, whether numbers and manufacturers are described or not.

Ensure this compatibility with the manufacturer of the lighting fixtures and include the price at the tender.

2.3 RECEPTACLES

.1 Duplex receptacles, 5-15 CSA Type R, 125 V, 15 A, grounded U socket, with the following characteristics:

.1 Molded case.

.2 Lateral or rear connection of wire size 10 AWG.

.3 Severing links for conversion in divided doses.

.4 Eight (8) rear connection ports, four (4) screw terminals for side connections.

.5 Triple sliding contacts and riveted grounding contact.

.2 Normal receptacles, type CSA 5-15 R, 125 V, 15 A, dimpled grounded U, with the following characteristics:

.1 Molded case.

.2 Lateral or rear connection of wire size 10 AWG.

.3 Four (4) rear connection ports, two (2) screw terminals for side connections.

.3 Other voltage outlets and permissible intensity as indicated.

.4 All outlets and switches grouped together must be of the same model and covered with a single plaque.

.5 For the entire installation, use only components from a single manufacturer.

.6 For quality "Specifications Grade", equipped with a ground, such that:

Description	Decora
Normal receptacles:	
– 15 A, 120 V:	16241
– 20 A, 120 V:	16341
– 15 A, 208 V, 1 PH, 3 F:	16641
– 20 A, 208 V, 1 PH, 3 F:	16441
Duplex receptacles:	
– 15 A, 120 V (commercial quality):	16252
– 20 A, 120 V (commercial quality):	16352
– 15 A, 120 V (industrial quality):	7280
– 20 A, 120 V (industrial quality):	7380
– 15 A, 208 V, 1 PH, 3 F:	16662
– 20 A, 208 V, 1 PH, 3 F:	16462
Cleaning receptacles:	
– 20 A, 120 V (5-20R):	16352
The numbers are from Lutron Company unless otherwise indicated.	

.7 Use numbered switches from Leviton company, unless otherwise stated.

2.4 COVER PLATES

.1 Equip all wiring devices with a cover plate such that it complies with CSA Standard C22.2 No. 42.1.

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

.3 Stainless steel cover plates, vertically brushed, 1 mm thick.

.4 Lid plates: sheet metal for wiring devices mounted in boxes for conduit type FS or FD type conduit boxes.

.5 Polycarbonate cover plates, weatherproof, with gaskets for double sockets, whether a plug is inserted or not and bear the marking "Extreme service" as indicated.

.6 In general, nylon, unbreakable, color coordinated with the wiring device.

.7 In mechanical rooms, local electricity, telephone, storage, and concierge, galvanized steel.

.8 Plates on FS boxes are made of steel with rounded corners.

2.5 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify material in accordance with section 26 05 53 - Identifications of electrical systems.

2.7 LIST OF MANUFACTURERS

.1 Electrical outlets, switches, and low voltage lighting controls:

- .1 Lighting switches and sockets:
  - .1 Cooper (Arrow-Hart)
  - .2 Hubbell
  - .3 Leviton
  - .4 Pass & Seymor
  - .5 Or approved equivalent
- .2 Switch plates and sockets:
  - .1 Cooper (Arrow-Hart)
  - .2 Hubbell
  - .3 Leviton
  - .4 Pass & Seymour
  - .5 Temco
  - .6 Or approved equivalent
- .3 Lighting dimmers:
  - .1 Leviton
  - .2 Lutron
  - .3 Prescolite
  - .4 Strand
  - .5 Or approved equivalent
- .4 Floor outlets:
  - .1 Cooper (Arrow-Hart)
  - .2 Hubbell
  - .3 Leviton
  - .4 Pass & Seymour

.5 Thomas & Betts

.6 Wellmark

.7 Or approved equivalent

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Consultant.

.2 Inform the Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied, and after receipt of written approval to proceed from the Consultant.

3.2 INSTALLATION

.1 Receptacles:

.1 Install receptacles in gang-type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height as indicated as prescribed in section 26 05 00.01 – Electrical – Common work results.

.3 Install GFI type receptacles as indicated.

.4 The location of outlets and outlets may be changed without additional charge or credit, provided that the displacement does not exceed 3000 mm and that notice is given before installation.

.2 Cover plates:

.1 Install suitable common cover plates where wiring devices are grouped.

.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.3 Add to "P-Touch" the identification "ASSC" when the outlet is supplied by an uninterruptible power supply system.

.3 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount switches at height as indicated as prescribed in section 26 05 00.01 – Electrical – Common work results.

.4 Place light switches near doors, handle side.

.1 In the rooms of mechanical installations and elevator machinery, place the switches near the doors, on the side of the handle.

.4 Dimmer:

.1 Ensure compatibility between the dimmer for fluorescent lamps with the ballast of fluorescent fixtures before installation.

3.3 PROTECTION

.1 Protect the equipment and the elements installed against any damage during the construction work.

.2 Protect the finish of the stainless steel cover plates with a sheet of paper or plastic wrap which will not be removed until all painting and other work is completed.

.3 Repair damage caused to adjacent materials and equipment by the installation of wiring devices.

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PART 3 EXECUTION

3.1 INSTALLATION

Part 1 General

1.1 SUMMARY

.1 This section includes:

.1 Requirements of various types of moulded case circuit breakers available with optional features.

1.2 REFERENCES

.1 CSA Group (CSA):

.1 CSA C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 20 00 10 – Mechanical and electrical general instructions.

.2 Shop Drawings:

.1 Without exception, shop drawings are required for the following items:

.1 All circuit breaker types covered by this section.

.2 Include time-current characteristic curves for breakers with ampacity of 60 A and over or-with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

.3 Certificates:

.1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit three 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations. Production certificate of origin must be submitted Consultant for approval.

.2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.

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

.4 Production certificate of origin must contain:

.1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.

.2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

.3 Contractor's name and address and person responsible for project.

.4 Name and address of building where circuit breakers will be installed:

.1 Project title (title indicated in specifications or on plans).

.2 End user's reference number.

1.4 DOCUMENTS/ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents/elements, in accordance with section 20 00 10 – Mechanical and electrical general instructions

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Molded case circuit breakers and accessory protectors against high fault currents.

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

.3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3 and 8 times current rating.

.5 Circuit breakers rated 400 A or greater to include electronic trip unit.

.6 Circuit breakers with interchangeable trips as indicated.

.7 Circuit breakers to have interrupting capacity rating as indicated.

.1 Minimum short-circuit interrupting capacity of circuit breakers:

.1 120/208V: 10 kA

.2 102/240 V: 10kA

.3 347 V: as per the instructions in the electrical panel.

2.2 THERMAL MAGNETIC BREAKERS

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

2.3 THERMOMAGNETIC CIRCUIT BREAKERS AND CURRENT LIMITERS FOR SERIES INSTALLATION

.1 Thermomagnetic circuit breakers with current limiters.

.1 Time-current characteristics coordinated with those of the trip units.

.2 Coordination must be established so that the circuit breaker can cut fault currents up to the maximum value of its breaking capacity.

.2 Circuit breakers for series installation must have been verified by the manufacturer and be approved. The installation and use of these circuit breakers should be in accordance with the manufacturer's guidelines and accepted methods.

.1 The use of circuit breakers must be in accordance with the manufacturer's guidelines and recognized methods.

2.4 OPTIONAL DEVICES

.1 Include the following, as indicated:

.1 Bypass trip unit.

.2 Auxiliary switch.

.3 Undervoltage release.

.4 "On off" locking device.

.5 Lever mechanism.

2.5 ENCLOSURE

.1 Sprinkler-proof housing.

2.6 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 53 – Identification of electrical systems.

2.7 ACCEPTABLE PRODUCTS

.1 Eaton

.2 General Electric

.3 Groupe Schneider

.4 Siemens

.5 Or approved equivalent.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

.2 Provide hardware fittings when required.

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3.4 LUMINAIRE ALIGNMENT

Part 1 General

1.1 SUMMARY

.1 Section content:

.1 This section covers lighting fixtures, their components and installation methods.

1.2 REFERENCES

.1 American National Standards Institute / Institute of Electrical and Electronics Engineers (ANSI / IEEE):

.1 ANSI / IEEE C62.41-1991 - Recommended Practice for Surge Voltages in Low Voltage AC Circuits.

.2 ASTM International Inc.:

.1 ASTM-F1137-00 (2006) - Standard Specification for Phosphate / Oil and Phosphate / Organic Corrosion Protective Coatings for Fasteners.

.3 Canadian Standards Association (CSA) / CSA International:

.1 CSA-C108.6 - Limits and methods of measurement of electromagnetic disturbance characteristics of industrial scientific and medical (IDM) radio equipment.

.4 Federal Communications Commission (FCC) Rules and Regulations - Part 15.

.5 ICES-005 - Interference - Standard Production Equipment - Lighting Equipment.

.6 Underwriters Laboratories of Canada (ULC).

.7 IESNA, Lighting Manual, 10th Edition.

1.3 DOCUMENTS TO BE SUBMITTED FOR APPROVAL / INFORMATION

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Shop drawings:

.1 Submit complete photometric data for proposed fixtures, established by independent testing laboratory.

.2 These photometric data must include the following, if applicable: table illustrating the CVP rate, device spacing criteria.

1.4 RESPONSIBILITIES

.1 Before submitting shop drawings, the Contractor is responsible for ensuring that each lighting fixture submitted can be controlled according to the characteristics and performance requirements of the lighting control system of this project.

.2 The acceptance of the shop drawings by the Engineer in no way releases the Electrical Contractor from his responsibility to verify the compatibility between the lighting fixtures and the lighting control system. In the event that a lighting fixture is found to be incompatible, the Contractor and the manufacturer of the device will be held jointly responsible and will have to replace the incompatible components, at no additional cost to the Owner.

.3 The brands and model numbers of the lighting fixtures on the plans are used to define the requirements in terms of physical criteria, performance criteria, operating criteria and installation criteria. The Contractor is responsible for ensuring that the devices offered meet these criteria. In the event that equivalents are offered, the Contractor must strictly comply with the requirements described in section 26 05 00.01 - Electrical – Common work results.

.4 In the event that a product is supplied as a replacement for what is prescribed in the plans and specifications, the Contractor is responsible for:

.1 Provide a point-by-point photometric calculation carried out with AGI32 for all the premises affected by the change. This calculation must be provided in PDF format and be signed by an engineer who is a member of the Order of Engineers of Quebec.

.2 Demonstrate that said substitution meets the same performance criteria as the equipment specified in the plans and specifications.

.3 Provide the products specified in the plans and specifications as is in the event that the Contractor is unable to produce the calculations and demonstrations required in the previous articles.

1.5 DOCUMENTS / ELEMENTS TO BE SUBMITTED ON COMPLETION OF THE WORK

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Operation and maintenance sheets (E&E): provide operating and maintenance instructions, which will be incorporated into the E&E manual.

Part 2 Product

2.1 GENERAL

.1 All devices must be products distributed in Canada and for which it is possible to have support in French.

.2 All lighting fixtures must be guaranteed five (5) years by the manufacturer. This warranty includes the light source, the pilot, the frame of the device, as well as all the accessories that are an integral part of the device.

.3 Devices that do not have a five (5) year warranty available directly from the manufacturer must be insured separately through an extended warranty. Proof of this assurance must be provided on the shop drawings.

2.2 PILOTS

.1 Drivers for light-emitting diodes (LEDs), unless otherwise indicated, CSA approved and having the following characteristics:

- .1 Nominal voltage at 120, 208 or 347 V according to plans, 60 Hz.
- .2 Enclosed and designed for use at a temperature of 40°C.
- .3 Thermal protection:
  - .1 The pilot must reduce the output power in the event of high operating temperature until the luminaire stops in the event of a critical temperature.
  - .2 When the operating temperature returns to normal, the pilot must automatically re-energize the luminaire.
- .4 0-10 V dimming, unless otherwise indicated.
- .5 UL class 2 pilots must meet UL1310 standard.
- .6 UL class 1 pilots must meet UL1012 standard.
- .7 Harmonic distortion rates must not be greater than 10%.
- .8 Lifespan greater than or equal to the lifespan of the light-emitting diode (LED) modules of the luminaire.
- .9 Be provided with protection against short circuits.
- .10 Be provided with protection against open circuits or partial loads.
- .11 Be equipped with surge protection.
- .12 Produce a sound level inaudible to the human ear.
- .13 Be of adequate power with the load connected.
- .14 Power factor greater than 0.9.
- .15 Possibility of having the pilot deported, as indicated.

2.3 FINISHES

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

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.5 LUMINAIRES

.1 As indicated in the table of luminaires indicated on the plans.

Part 3 Execution

3.1 GENERAL

.1 The clauses below apply to all lighting fixtures, including specialized fixtures, unless otherwise specified.

3.2 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 The Contractor shall refer to the architectural plans for the exact location of the lighting devices in his architectural assemblies.

.3 The exact location of the lighting fixtures must be coordinated with the plans of the reflected ceilings. In disputed cases, check with the Architect and Engineer.

.4 The connection of the luminaires to the distribution networks will be carried out in conduits. A maximum length of three (3) m of AC-90 (BX) armored cable will be accepted for device connection in the case of installed, built-in or suspended installations, unless otherwise indicated on the plan.

.5 Fixtures must be adequately supported for the type of ceiling system in which they are mounted. The mounting accessories must be suitable for the type of ceiling system, supplied with the luminaire and offered when sending the shop drawings.

.6 Coordinate on site the exact position of all light fixtures to be installed in mechanical rooms or in ventilation units after mechanical equipment is installed.

.7 Install light fixtures when work likely to soil them is completed.

.8 In some places, a few light fixtures are installed under the ventilation ducts.

.9 Supply and install all the materials (angles, plaster frames, supports, etc.) necessary for the complete and perfect installation of the luminaires.

3.3 WIRING

.1 Connect fixtures to lighting circuits.

.1 Install wiring in rigid or flexible conduits as indicated.

.2 In accordance with standards, class 2 control wiring cannot be installed in the same conduit as the lighting fixture power supply.

3.4 LUMINAIRE ALIGNMENT

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

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

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1.1 REFERENCES

.1 Building Industry Consulting Service International (BICSI):

.1 Telecommunications Distribution Methods Manual (TDMM), 13th Edition.

.2 American National Standards Institute/Telecommunications Industry Association:

.1 ANSI/TIA-569-C, Telecommunications Pathways and Spaces.

1.2 SYSTEM DESCRIPTION

.1 Network conduits and empty boxes for wiring systems, Division 27.

.2 The Contractor must pay particular attention to the requirements associated with the design of the equipment and installation characteristics required to complete the ductwork and empty boxes described in this specification and / or shown on the associated plans.

.3 No supplement will be given to the requirements described in this quote and / or shown until associated plans are complete.

Part 2 Product

2.1 METAL CONDUITS

.1 Use the size required by the Quebec Building Code, Chapter V - Electricity, unless otherwise indicated, minimum 21 mm in diameter.

.2 Galvanized steel, rigid, thin-walled, unless otherwise indicated (TEM).

.3 Connectors and conduit fittings, thin-walled steel, screw type. Zinc or zinc-steel fittings are prohibited.

.4 Metal caps with grounding connection for cable protection against rubbing at the conduit output.

2.2 PULL BOXES

.1 Steel, minimum 14 gauge, painted with two coats of gray enamel inside and outside.

.2 Without factory-made knockouts.

.3 Frame having a minimum width of 25 mm.

.4 Boxes provided with angled steel frame to form a rigid assembly, which will be absent of any deformation during the pulling of communications cables.

.5 Covers are easily removable in sections with captive screws and hinges. Hinges with removable pins are accepted.

.6 Custom made boxes when necessary, to meet the requirements of this specification including the dimensions below:

Maximum dimension of the conduit segment through the pull box mm (in)	Width mm (in)	Length mm (in)	Depth mm (in)	For each additional segment of conduit through the pull box, the width must be increased by: mm (in)
21 (¾)	100 (4)	300 (12)	75 (3)	50 (2)
27 (1)	100 (4)	400 (16)	75 (3)	50 (2)
35 (1¼)	150 (6)	500 (20)	75 (3)	75 (3)
41 (1½2)	200 (8)	675 (27)	100 (4)	100 (4)
53 (2)	200 (8)	900 (36)	100 (4)	125 (5)
63 (2½)	250 (10)	1050 (42)	125 (5)	150 (6)
78 (3)	300 (12)	1200 (48)	125 (5)	150 (6)
91 (3½)	300 (12)	1350 (54)	150 (6)	150 (6)
103 (4)	375 (15)	1500 (60)	200 (8)	200 (8)

2.3 SLIDING SLEEVES

.1 Sliding sleeve made of galvanized steel of the same thickness as the conduit, specially manufactured with three screws at each end, of sufficient length to cover both ends of a sleeve with spaced conduit/pipe overlap of 200 mm.

.2 Provide the necessary anchors and supports allowing free movement of sliding sleeves.

.3 Install a copper bonding jumper in a conduit for the continuity of the mass. The attachment points of these jumpers should not impede the free passage of the sleeves.

2.4 CONDUIT SUPPORTS

.1 Branded steel supports by Canstrut or approved equivalent.

2.5 PULL ROPES

.1 Pull rope of 9.525 mm with a minimum strength of 220 lb (100 kg).

2.6 LIST OF MANUFACTURERS

.1 Metal conduits EMT:

.1 Columbia International Ltd.

.2 Siezfried Kreser Industries Ltd.

.2 Pull boxes:

.1 Bel Products

.2 Iberville

.3 Roger Girard

.4 Temco

.3 Supports:

.1 Burndy
.2 Canstrut
.3 Hilti
.4 Pilgrim
.5 Unistrut

.4 Cable Trays:

.1 Legrand-Cablofil
.2 Copper B-Line – Flextray
.3 Thomas and Betts – Express Tray

Part 3 Execution

3.1 INSTALLATION

.1 Install empty conduits and all the materials below required to build a complete network: conduits, pull boxes, lids, sleeves, pull cords, fastening accessories and other accessories required to complete the work described and locate the material so as to form a complete system.

.2 All ducts must be electrical metallic tubing (EMT), unless explicitly stated otherwise.

.3 The minimum diameter for EMT conduits is 21 mm.

.4 In wells, lay the conduits so as not to clutter the space to allow for future installations. Have approved by the Engineer, forecasted sites for future work before work begins.

.5 Unless otherwise indicated, conceal all conduits in the walls, floors, ceilings.

.6 No conduits should be installed in concrete slabs.

.7 Install protruding conduits in parallel with structural lines and so as not to harm the equipment of other trades.

.8 No drilling should be done through the beams and columns for the passage of conduits.

.9 Maintaining the continuity of the conduits throughout the facility, taking care to make solid connections between the conduits. Connect them to the grounding approved by the building, according to the Quebec Building Code, Chapter V - Electricity. Check continuity of the conduits for all networks and installed and / or modified boxes, once the full installation is complete.

.10 Attach sections of thin-walled conduits with fittings.

.11 During construction, join unfinished conduit raceways together with caps to prevent the ingress of foreign bodies.

.12 Attach the conduits as follows:

.1 Supply and install all the necessary supports for electrical work. These supports should be made of galvanized steel.

.2 Conduits:

.1 When the insulated conduits are in contact with a surface of concrete or masonry, affix using cast iron or steel straps.

.2 When a group of channels (two or more) flows in parallel, affix the steel supports anchored directly to the frame by means of threaded rods or other supports.

.3 The size of the rods, supports, and spacing of supports are based on weight bearing and required by the Quebec Building Code, Chapter V - Electricity. When pipes of various sizes are grouped, the spacing of the supports is determined by the smallest conduit of that group.

.3 Install cross bracing spaced up to 12 m center to center and longitudinal bracing on all horizontal runs of conduits at 300 mm suspended by the ceiling tile. This requirement may be omitted if the maximum diameter is less than 65 mm for an individual conduit or if the group of conduits has a total weight less than 15 lb/m.

.13 The spacing of supports and fasteners must be in accordance with the latest edition of the Quebec Construction Code, Chapter V – Electricity.

.14 Support vertical conduits at floor level and more intermediate supports required by the Quebec Building Code, Chapter V – Electricity.

.15 In suspended ceilings, conduit supports are fastened to the frame and not the ceiling structure.

.16 The conduits should not touch the insulation of ducts or mechanical equipment or be buried in the insulation or fireproofing materials.

.17 No section of conduit should be more than 30.5 m (100') long or have more than two 90 ° bends or a total radii of greater than 180º between two sliding sleeves or two pull boxes.

.18 Use pull boxes for conduit segments, when required according to this section.

.19 When it is impossible to install a pull box, a sliding sleeve is allowed on conduit segments having an inner diameter 50 mm (2") or more. Dimensions conform to the references in this section due to existing facilities or architectural or structural constraints.

.20 Always install pull boxes in straight conduit segments. A pull box should not replace an elbow. Pull boxes should not serve as a T. Align in the axis, the corresponding ends of sections of conduit situated on either side of the pull box. Align both ends in the same axis when a conduit is present on one side and two conduits are present on the other. Refer to TDMM in BICSI for installation details.

.21 It is forbidden to use fitting types LB, LL, LR and access fittings, for any reason.

.22 The internal curvature radius of the conduits must be equal to at least six times their inner diameter for conduits of 50 mm and less.

.23 The internal curvature radius of the conduits must be equal to at least ten times their inner diameter for the conduit more than 50 mm.

.24 Join end caps to the ends of all conduits in order to prevent damage to the cable during the pulling thereof.

.25 Adjust the conduits and their supports well enough to adequately resist the tensions created by pulling the cable.

.26 Install a pull rope in the installed conduits raceways.

.27 All conduits must meet the requirements of the appropriate codes and guidelines.

.28 Always use an appropriate fire system, including a sleeve, in addition to TEM installed through walls and floors.

.29 Ensure vertical sleeves pass through the floor 100 mm above the surface of the finished floor.

.30 Specify the location of pull boxes on drawings.

3.2 PULL BOXES

.1 Install all pull boxes or junction boxes indicated in the plans or which are necessary to make the installation conform to this specification and related plans.

3.3 ACCESS DOOR

.1 Refer to architectural documentation for the location of all ceiling sections which are or will become inaccessible following the work.

.2 Supply and install special access doors with dimensions according to architectural specification documents to allow access to each of the pull boxes or sliding sleeves installed in ceiling sections which are or will become inaccessible following the work.

.3 Access doors must be the same size as pull boxes and sliding sleeves by adding 200 m upstream and 200 mm downstream. Moreover, the lids of underfloor pull boxes will be easily removed and the sliding of the sleeves will be readily accomplished once the access doors open.

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3.1 J HOOKS

3.2 GROUND

Part 1 General

1.1 REFERENCES

.1 Building Industry Consulting Service International (BICSI):

.1 Telecommunications Distribution Methods Manual (TDMM), 13th Edition.

.2 American National Standards Institute/Telecommunications Industry Association:

.1 ANSI/TIA-569-C, Telecommunications Pathways and Spaces.

.2 ANSI/TIA-607-B, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

.3 Canadian Standards Association (CSA):

.1 C22.2 no. 126.1-09 (R2014) Metal cable tray systems (Standard bi-national, avec NEMA VE 1-2009).

.4 Electronic Components Industry Association (ECIA):

.1 EIA/ECA-310-E Cabinets, Racks, Panels, and Associated Equipment.

Part 2 Product

2.1 GROUND CABLE

.1 Cable type RW- 90 copper, provided with an insulating sheath of green color, size consistent with the recommendations of the Standard ANSI/TIA-607-B depending on the connection.

2.2 J HOOKS

.1 J hooks in pre-galvanized steel:

.1 Fixing method: screw.

.2 Hook diameter: 50 mm.

.3 Retaining closure for the cables.

.4 Bracket with 6.35 mm hole for ceiling mounting.

.5 Fastening screw selected according to the material where the hook is attached.

.6 Model no. CAT32HPAB by Erico or approved equivalent.

Part 3 Execution

3.1 J HOOKS

.1 Install a network of J hooks to support communications cables in areas where no cable tray is provided.

.2 Install Velcro® type fasteners to group the cables supported by the J hook network.

.3 J hooks must be spaced a maximum distance of 1.5 m.

3.2 GROUND

.1 Connect each of racks, cabinets and cable trays to TMGB/TGB (as applicable) of the Telecommunications area using a grounding cable. Connection methods must comply with all recommendations in ANSI/TIA-607-B.

.2 Use connecting jumpers between all sections of cable trays.

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Part 1 General

1.1 REFERENCES

.1 Building Industry Consulting Service International (BICSI):

.1 Telecommunications Distribution Methods Manual (TDMM), 13th Edition.

.2 American National Standards Institute/Telecommunications Industry Association:

.1 ANSI/TIA-606-B – Administration Standard for Telecommunications Infrastructure.

1.2 DEFINITIONS

.1 Administration of the installation: includes both the identification of the installation and the installation registry that results.

.2 Free cable: cable or cable segment not being enclosed in a conduit or in any other kind of totally enclosed medium. For example, a cable traveling in an open cable duct or a J-hook network is considered a free cable.

.3 Connecting panel: includes both a connecting panel - copper and one connecting panel - optical fiber.

.4 Splitter strips: distribution equipment consisting of a frame on which are fixed strips of insulation displacement connectors (IDC) for configuring distribution of structured cabling system.

1.3 ABBREVIATIONS

.1 Some of the abbreviations used for identifying of the nomenclature are from ANSI/TIA-606-B, Administration Standard for Telecommunications Infrastructure.

1.4 GENERAL

.1 The Administration of the installation must be performed according to the Standard ANSI/TIA-606-B, Administration Standard for Telecommunications Infrastructure for a class facility 1.

.2 Ensure that all identifiers are affixed in French except in terms of English abbreviations defined in the ANSI/TIA-606-B standard.

1.5 SAMPLES

.1 Submit a sample of the labels and the plates of each type/size/color (fastening elements included) to the Engineer for verification prior to the manufacturing thereof.

.2 Each label and plate sent must be marked with a typical identifier.

.3 A list to describe the use of each of the labels and plates must be included with these prior to being sent.

1.6 ELEMENTS TO IDENTIFY

.1 The following should be identified for all of the installation:

.1 Workstations outlets and MUTOAs.
.2 Individual cables (twisted-pair, fiber optic, coaxial).
.3 Connecting panels.
.4 Splitter sliders.
.5 Consolidation point boxes.
.6 Optic cable fusion boxes.
.7 Telecommunications conduit.
.8 Telecommunications areas.
.9 Telecommunications grounding bars (TMGB and TGB).

1.7 INSTALLATION REGISTER

.1 An installation register in which we find each of the identified elements and some of their key features must be made by the Contractor responsible for this section.

.2 The setup register must be written on paper and put on CD in Microsoft Excel format in the principle defined by the ANSI/TIA-606-B.

.3 The setup register must be written in French except in terms of English abbreviations defined in the ANSI/TIA-606-B standard.

.4 Upon the completion of work, submit a paper copy of the installation register to the Engineer to return the commentary. If any of the required elements are missing or presented in an unsatisfactory manner, make the necessary changes and submit a new copy to the Engineer. Once the installation registry is accepted and returned by the Engineer, the Contractor responsible for this section must sign and date it and insert one copy in the "Project Manual".

Part 2 Product

2.1 MATERIAL IDENTIFICATION

.1 Label:

.1 Laminated adhesive label made of polyester, polyolefin or a material with similar mechanical strength.
.2 Printed using a laser printer or thermal transfer.

.2 Nameplate:

.1 Plate made of a combination of polyester and polyolefin or materials with similar mechanical strength.
.2 Printed using a thermal transfer printer.
.3 Installation using two cable ties, black nylon and resistant to ultraviolet rays.

.3 Identification features of materials according to the identified item:

.1 Print color is always black.

.2 The fonts must be the same throughout the identification of the entire system.

.3 The size of the font must be the same for the identification of elements of the same type fill the optimal print area.

Elements to identify	Labels	Plates	Dimensions	Background colours
Workstation outlets and MUTOAs	X (*)		(**)	Blanc
Individual cables, Ø to 2.02 to 4.04 mm (0.08 to 0.16")	X		25.4 mm x 19.05 mm (1" x 0.75")	Blanc
Individual cables, Ø to 4.04 to 8.09 mm (0.16 to 0.32")	X		1" x 1.5" 25.4 mm x 38.1 mm (1" x 1.5")	Blanc
Individual cables, Ø to 8.09 to 12.13 mm (0.32 to 0.48")	X		25.4 mm x 57.15 mm (1" x 2.25")	Blanc
Individual cables, Ø to 12.13 to 25.4 mm (0.48 to 1")		X	12.7 mm x 50.8 mm (0.5" x 2")	Jaune
Individual cables, Ø to 25.4 mm (1") and greater		X	25.4 mm x 50.8 mm (1" x 2")	Jaune
Connecting panels	X (*)		(**)	Blanc
Dispatchers strips and demarcation point (***)	X (*)		(**)	Orange
Dispatchers Strips and network connection	X (*)		(**)	Vert
Dispatchers strips and common facilities	X (*)		(**)	Blanc
Dispatchers strips and frame links – First level	X (*)		(**)	Violet
Dispatchers strips and frame links – Second level	X (*)		(**)	Gris
Dispatchers strips and frame links – Outside distribution	X (*)		(**)	Brun
Dispatchers strips and horizontal link	X (*)		(**)	Bleu
Dispatchers strips and emergency systems	X (*)		(**)	Rouge
Dispatchers strips – Various	X (*)		(**)	Jaune
Consolidation boxes	X		50.8 mm x 76.2 mm (2" x 3")	Blanc
Fused fiber optics boxes	X		50.8 mm x 76.2 mm (2" x 3")	Blanc
Telecommunications conduit, Ø to 21 to 35 mm (0.75 to 1.25")		X	12.7 mm x 50.8 mm (0.5" x 2")	Blanc
Telecommunications conduit, Ø to 41 to 103 mm (1.5 to 4")		X	25.4 mm x 50.8 mm (1" x 2")	Blanc
Telecommunications areas	X		76.2 mm x 101.6 mm (3" x 4")	Blanc
Telecommunications grounding bar (TMGB and TGB)	X		25.4 mm x 76.2 mm (1" x 3")	Blanc

(*) Use a non-adhesive label covered with a transparent plastic cover when the item is designed for the use of this method of identification.
(**) According to product dimensions.
(***) By service provider.
Ø Rated outer diameter or inner diameter as appropriate.

Part 3 Execution

3.1 GENERAL

.1 Identification of wiring network elements must be made mechanically, cleanly, clearly and indelibly.

.2 Pay particular attention to carefully affix the identification materials. If one or more is affixed diagonally, awkwardly cut or inconsistent formats, decentered, poorly printed, printed in small print, handwritten, placed in the wrong places, overlapped or have any other characteristic considered unacceptable by the Engineer, the identification work will be repeated where necessary.

.3 Apply a blue dot sticker of 19.05 mm (0.75") in diameter on the reverse side-bar of a suspended ceiling where there are cables wound for future use to enable the Owner to know the location of these without moving the acoustic tiles.

.4 At the end of the work of all divisions, all identification covered in this section should remain visible. If the work of another section or another division were to impair the visibility of the identifications, the Contractor will have to adjust communications or redo them to the satisfaction of the Engineer.

.5 All conduits and free cables of the distribution Frame passing through a floor or a manhole without being terminated must be identified on the floor or in the manhole in question.

3.2 PATRON IDENTIFICATION

.1 Telecommunication areas:

.1 Identify telecommunication areas by placing the identifier on the central position the highest point of the inside of the door.

.2 Follow the numbering described in the table below:

Identifier	Description
FS	Telecommunication area

F: identifying the floor in the building (S1, S2, A, B, M, RC, 0, 1, 2, 3, etc.).

S: letter identifying the telecommunications area on the floor (A, B, C, D, etc.).

.3 Example: 1A

.1 First (1) floor.

.2 Telecommunication Area A.

.2 Horizontal Links:

.1 Identify each of the cable ends of the horizontal links 300 mm (12") below them.

.2 Identify each of the outlets on the mounting plate or on their MUTOA enclosure.

.3 Identify each port dispatcher strip and connection panels.

.4 Follow the numbering described in the table below:

Identifier	Description
FS-ANNN	Horizontal Link – Cables, outlets, dispatcher strips, connection panels.

FS: identifies the telecommunications area.

A: letter identifying the dispatcher strips or connection panel.

NNN: sequential number identifying the port splitter strips or connection panel starting at 001.

.5 Example: 2A-B016

.1 Second (2) floor.

.2 Telecommunication area A.

.3 Splitter strips or connection panel B.

.4 Port 016.

.3 Intra-building Frame links:

.1 Identify each of the cable ends of the intra-building frame links at 300 mm (12") below them.

.2 Identify each port dispatcher strip and connection panels.

.3 Follow the numbering described in the table below:

No.	Description
fs1/fs2-n	Intra-Building Frame Links – Cables, disptacher port strips, connection panel port.

fs1: identifies the telecommunications area where one end is found.

fs2: identifies the telecommunications area where the other end is found.

n: sequential number of the Frame linking fs1 and fs2 areas.

.4 Example: 2A/6A-3

.1 Intra-building frame no. 3 Link between 2A and 6A telecommunications areas.

.4 Inter-building Frame Links:

.1 Identify each of the cable ends of the inter-building frame links within 300 mm (12") of the ends.

.2 Identify each port dispatcher strip and connection panel.

.3 Follow the numbering described in the table below:

No.	Description
[b1-fs1]/[b2-fs2]-n	Inter-Building Frame Links– Cables, disptacher port strips, connection panel port.

[b1-fs1]: building identifier and the telecommunications area where one end is located.

[b2-fs2]: building identifier and telecommunications area where the other end is located.

n: sequential number of the inter-building Frame link.

.4 Example: [PAVD-1B]/[PAVF-8A]-5

.1 Inter-building Frame link between no. 5 1B telecommunications areas and pavilions 8A, D and F, respectively.

.5 Frame links between sites:

.1 Identify each of the cable ends in the inter-site Frame links at 300 mm below the ends.

.2 Identify each port dispatcher strip and connection panel.

.3 Follow the numbering described in the table below:

No.	Description
[c1-b1-fs1]/[c-b2-fs2]-n	Intersite Frame Links – Cables, disptacher port strips, connection panel port.

[c1-b1-fs1]: identifying the site, the building and the telecommunications area where end is located.

[c2-b2-fs2]: identifying the site, the building and the telecommunications area where the end is located.

n: sequential number of the intersite Frame link.

.4 Example: [MCGILL-PAVA-1A]/[PEEL-PAVD-2A]-2

.1 Frame link between sites no. 2 between 1A and 2A areas, pavilions A and D, MCGILL Site, PEEL Site respectively.

.6 Intra-building telecommunications conduit:

.1 Identify each end of the intra-building telecommunications conduits at 300 mm (12") below the ends, include the ends joined in pull boxes.

.2 Follow the numbering described in the table below:

No.	Description
fs1/fs2-PCN.n(Ø)	Intra-Building Telecommunications Conduit

fs1: identifier of the telecommunications area where one end is located.

fs2: identifier of the telecommunications area where the other end is located.

PCN: inscribed to designate a conduit.

n: sequential number of the duct between the fs1 and fs2 areas.

Ø: rated inside diameter of the pipe in inches (X") or millimeter (X mm) according to the scale used in the Engineering documents.

.3 Examples:

.1 1B/3A-PCN.2 (100 mm (4")):

.1 Telecommunications conduit no. 2, a rated inside diameter of 100 mm (4") between 1B and 3A telecommunications areas. Imperial scale.

.2 B/3A-PCN.2 (103 mm (4")):

.1 Telecommunications conduit no. 2, a rated inside diameter of 103 mm (4") between 1B and 3A telecommunications areas. Metric scale.

.4 Table of equivalence to be used for rated internal diameters of the TEM conduits when converting from metric to imperial scale or imperial to metric scale:

mm	Inches
16	½
21	¾
27	1
35	1¼
41	1½
53	2
63	2½
78	3
91	3½
103	4

.7 Inter-building telecommunications conduit:

.1 Identify each end of the inter-building telecommunications conduit at 300 mm (12") below the end, including the ends attached to the manhole.

.2 Follow the numbering described in the table below:

Nos.	Description
[b1-fs1]/[b2-fs2]-PCN.n(Ø)	Inter-Building Telecommunications Conduit – building construction segment
[b-fs]/[PMH.n]-PCN.n(Ø)	Inter-Building Telecommunications Conduit – Manhole building segment
[PMH.n1]/[PMH.n2]-PCN.n(Ø)	Inter-Building Telecommunications Conduit – manhole to manhole

[b1-fs1]: identifier of the telecommunications area where one end is located.

[b2-fs2]: identifier of the telecommunications area where the other end is located.

[b-fs]: identifier of a telecommunications area in the building.

PCN: inscribed to designate a conduit.

PMH: inscribed to designate a manhole.

n: sequential number of a manhole or a conduit between [fs1-b1] and [b2fs2], [b-fs] and [PMH.n] or [PMH.n1] and [PMH.n2].

n1: sequential number of the manhole where one end is located.

n2: sequential number of the manhole where the other end is located.

Ø: rated inside diameter of the pipe in inches (X") or millimeter (X mm) according to the scale used in the Engineering documents.

.3 Examples:

.1 [PAVA-1A]/[PAVB-2A]-PCN.2 (100 mm (4"))

.1 Telecommunications conduit no. 2, a rated inside diameter of 100 m (4") between telecommunications areas 1A and 2A, and pavilions A and B respectively.

.2 [PAVA-1A]/[PMH.1]-PCN.1(103 mm (4"))

.1 Telecommunications conduit no. 1, a rated inside diameter of 103 mm (4") between 1A telecommunications areas 1A and the manhole no. 1.

.3 [PMH.1]/[PMH.2]-PCN.3 (100 mm (4"))

.1 Telecommunications conduit no. 3, a rated inside diameter of 100 mm (4") between the manholes 1 and 2.

.4 Note that abbreviation PHH replaces PMH if an access point is identified instead of a manhole.

.8 Telecommunications grounding bars:

.1 Identify telecommunications grounding bars (TMGB/TGB).

.2 Follow the numbering described in the table below:

Nos.	Description
FS-TMGB	Main telecommunications grounding bar
FS-TGB	Telecommunications grounding bars

FS: identifies telecommunications area.

TMGB: identifies the main telecommunications grounding bar.

TGB: identifies other telecommunications grounding bars.

.3 Example: 0A-TMGB

.1 Floor 0.

.2 Telecommunications area A.

.3 Telecommunications grounding bars.

.9 Optical fibers fusion boxes and consolidation points:

.1 Identify optical fiber fusion boxes and consolidation points on the side facing the ground.

.2 Apply a green dot sticker of 19.05 mm (0.75") in diameter on the reverse side-bar of a suspended ceiling where we find a consolidation point to allow the Owner to know their location without having to move the acoustic tiles.

.3 Affix an orange dot sticker of 19.05 mm (0.75") in diameter on the inverted tee bar suspended ceiling where we find an optical fiber fusion box to allow the Owner to know the location of the latter without having to move the acoustic tiles.

.4 Follow the numbering described in the table below:

Nos.	Description
BFU.n	Fiber optic fusion box
BPC.n	Consolidation point box

BFU: identifies a designated fiber optic fusion box.

BPC: identifies a designated consolidation point box.

n: sequential box number.

3.3 INSTALLATION REGISTER

.1 Communications Contractor must take note of the annexed register and complete installation its installation.

.2 The blank file of the installation register in Microsoft Excel format is sent to the communications Contractor at the start of the project.

.3 Before printing and saving the installation register, sort the lists as follows:

.1 Telecommunications areas: by floor.

.2 Horizontal links: by premises/room number.

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Part 1 General

1.1 REFERENCES

.1 Building Industry Consulting Service International (BICSI):

.1 Telecommunications Distribution Methods Manual (TDMM), 14th Edition.

.2 American National Standards Institute/Telecommunications Industry Association:

.1 ANSI/TIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises.

.2 ANSI/TIA-568-C.1 – Commercial Building Telecommunications Cabling Standard.

.3 ANSI/TIA-568-C.2 – Balanced Twisted-Pair Telecommunication Cabling and Components Standard.

.4 ANSI/TIA-606-B – Administration Standard for Telecommunications Infrastructure.

1.2 DEFINITIONS

.1 Telecommunications areas:

.1 Floor area dedicated entirely or in part to telecommunications equipment and the interconnections between them. The term "telecommunications areas" includes entry point communications services (ES), equipment rooms (SE), telecommunications rooms (ST) and telecommunications enclosures (ET).

.2 Primer:

.1 Cable with a connector at one end for performing an interconnection between a dispatcher and slider to a passive or active equipment port.

.3 Connector:

.1 Mechanical element used to enable alignment, connection, and continuity between conductors.

.4 Extension cord:

.1 Cable has a connector at each of its ends for connecting a terminal device to a telecommunications outlet.

.5 Connecting cord:

.1 Cable has a connector at each of its ends for connecting the ports of two devices in a telecommunication area.

.6 Crosstalk:

.1 Unwanted coupling between signal pairs in a given cable.

.7 Foreign crosstalk:

.1 Unwanted coupling of signals in a given cable from one or more other cables.

.8 Horizontal distribution:

.1 Segment cabling system connecting the telecommunications outlet to the distribution equipment in a telecommunications area.

.9 Telecommunications speakers (ET):

.1 Telecommunications area often used in small installations or substitutions in a telecommunications room, usually in the form of a cabinet or a wall bracket.

.10 Communications service entry:

.1 Entry of public telecommunications networks (including wireless) in a building, including the internal portion of the conduits and the rooms where they end.

.11 Active equipment:

.1 Electrically powered equipment whose role is to transmit, receive or process analog or digital signals. The active devices include, among others, switches, hubs, servers, routers, telephone systems, etc.

.12 Crossover:

.1 Generally designates one connecting panel (copper or fiber) or divider strips.

.13 Terminal equipment:

.1 Equipment in a building is connected to the horizontal distribution system: telephone, personal computer, printer, fax, camera, clock, controller, etc.

.14 Wire garters:

.1 Wire pairs unfinished by connectors for performing interconnections between dispatcher strips.

.15 MUTOA:

.1 "Multi User Telecommunication Outlet Assembly" - grouping multiple telecommunications images in one place, and accessible to users for facilitating the frequent configuration changes.

.16 Frame:

.1 Segment of the wiring system interconnecting the telecommunications areas.

.17 Consolidation point:

.1 Zone box containing a splitter strips and serving as the permanent interconnection between horizontal distribution from the telecommunications area and extending to the horizontal distribution outlets. A consolidation point aims to facilitate the redevelopment during modifications, additions or changes within an area.

.18 Connection panel:

.1 Distribution element consisting of intakes at the front and rear insulation displacement connectors for configuring physical distribution of structured cabling system ensuring the links between horizontal distribution, the active devices or the frame.

.19 Telecommunications outlet:

.1 Connecting piece set in a work area on which a horizontal distribution cable ends and an extension cord connects.

.20 PTNB cable:

.1 Composed of copper cable UTP.

.21 Crossover in strips:

.1 Distribution equipment consists of a frame on which are fixed strips of insulation displacement connectors for configuring physical distribution of structured cabling system ensuring the links between horizontal distribution, the active devices or the frame.

.22 Equipment room (SE):

.1 Main room dedicated to telecommunications including hosting servers, switches, and key telephone systems.

.23 Telecommunications room (ST):

.1 Room reserved for telecommunications equipment including hosting dispatchers to make the connection between the active devices, the horizontal distribution and distribution frame.

1.3 CONTRACTOR QUALIFICATIONS

.1 The work of this section must be performed by a contractor with the appropriate qualifications for this type of installation.

.2 Communications contractor must hold a certificate issued by the manufacturer for the distribution and installation of all components of the structured cabling system with which he is tendering so that the final installation is certified as required by the manufacturer’s warranty.

.3 Provide a copy of all documents issued by the manufacturer attesting the contractor's certification with the bid.

1.4 STRUCTURED CABLING SYSTEM OF TWISTED UNSHIELDED PAIRS

.1 Structured cabling system is a system is certified end to end and from a single manufacturer.

.2 Structured cabling system must be installed in accordance with ANSI/TIA 568-C and meet the performance prescribed by the manufacturer, they shall in no case be less than those prescribed by that standard.

.3 Performance of structured cabling system, unshielded twisted pair:

.1 Category: 6A.

.2 Minimum bandwidth: 500 MHz.

.3 Unless explicitly stated otherwise, all products of this section shall have the performance criteria required by this article.

1.5 WARRANTY

.1 Notwithstanding the other requirements of this specification in terms of security, structured cabling networks of this section will be certified and guaranteed against defects in material, manufacturing, and workmanship for a period of twenty years following the receipt of the certified system certification certificate which they belong. The communications contractor in partnership with the manufacturer undertakes to repair or replace, without material costs or labor, if they were to fail during this period.

Part 2 Product

2.1 EXTENSION CORDS

.1 Extension cord meets the performance requirements for cabling system in this section and the Standard ANSI/TIA-568-C.

.2 Unshielded flexible cord, composed of stranded conductors with 8P8C connectors (RJ-45) factory crimped at each end.

2.2 MODULAR JACK

.1 Modular jack meets performance requirements for cabling system in this section and the Standard ANSI/TIA-568-C.

.2 Modular plug whose cable is a UTP connection interface type insulation displacement and the position of cord socket type is 8P8C (RJ- 45).

.3 Modular jack compatible with the mounting plates and adapter provided.

2.3 MOUNTING PLATE AND ADAPTER

.1 Wall mounting plate:

.1 Wall mounting plate to be able to receive a minimum of four modular jacks, type defined in section "MODULAR JACK".

.2 Provide one type of wall mounting plate. The plate must be installed on a plaster plate, a recessed electrical box, and a floor monument.

.2 Surface mount adapter for modular partitions:

.1 Surface mount adapter for modular partitions to be able to receive three modular jacks, type defined in section "MODULAR JACK".

.2 Provide one type of surface mount adapter for modular partitions. The adapter must be installed on an opening of modular partitions type.

.3 Wall surface mounting adapter:

.1 Surface wall mounting adapter to be able to receive two modular jacks, type defined in section "MODULAR JACK".

.2 Provide one type of surface mount plate. The adapter must be installed on a wall surface.

.4 Mounting adapter plate Decora:

.1 Decora mounting adapters to be able to receive three modular jacks, type defined in section "MODULAR JACK".

.2 Provide one type of Decora mounting adapter. The adapter must be installed on a plaster plate, a recessed electrical box and a floor monument.

.3 Provide Decora cover plates for each output using this adapter.

.5 Using modular plugs manufactured by the manufacturing plates and adapters for outlets that remain unused. Modular valves shall be the same color as those of the plates and adapters.

2.4 PTNB CABLE

.1 UTP cable with four twisted pairs, a 100 ohms impedance line with performance requirements for cabling system in this section and the Standard ANSI/TIA-568-C.

.2 Classified UTP cable CMP (FT6) held the flame test.

2.5 FLAME RETARDANT

.1 Flame retardant used for sealing ducts, must have a fire resistance of two hours, must not let smoke, toxic fumes and water, some fireproof products of the company Hilti Canada 3M Canada or approved equivalent.

2.6 LIST OF MANUFACTURERS

.1 Structured cabling system UTP:

.1 Belden

.2 Commscope

.3 Hubbell (General Cable or Superior Essex)

.4 Leviton (General Cable wiring or Superior Essex)

.5 Panduit

.6 Siemon

Part 3 Execution

3.1 DRAW CABLE

.1 Follow the recommendations of BICSI and manufacturing for the draw of UTP cables.

.2 The maximum permitted pulling force for pulling the UTP cables is 111N (25 lbf) or as directed by the manufacturer if they are more restrictive.

.3 The minimum bend radius allowed for the UTP cable is four times its outside diameter or as directed by the manufacturer if they are more restrictive.

.4 After the cable draw, with the flame retardant, plug all the sleeves and/or ducts dedicated to telecommunications through a slab floor and/or ceiling, as well as through the fire walls and not only used conduits.

3.2 HORIZONTAL DISTRIBUTION

.1 On each level, the number of installed UTP cables required between each telecommunications output and telecommunications area that is designated to it to connect each modular jack to the distribution of equipment in accordance with the article "PULLING OF CABLES".

.2 Use only conduits, bushings, cable trays and/or J-Hooks provided to support telecommunications cables from the horizontal distribution.

.3 No intermediate connection other than those explicitly requested will be performed on the UTP cable runs. The cable must be direct and without change in polarity.

.4 In places where the cables are supported by J-hooks, consolidate them with Velcro® fastener to achieve a clean and structured system without compressing them. Particular attention must be paid so as not to compress the UTP category 6A cables so as to prevent alien crosstalk problems.

.5 Do not bundle the cables in cable trays.

.6 Each UTP cable installed for horizontal links must have maximum length not exceeding 90 m between the modular jack and the serviced distribution device of the telecommunications area where it is connected.

3.3 FRAMING

.1 Install multi-pair cables to connect framed telecommunications areas between them, as shown on the plans, and in accordance with the article "CABLE DRAW".

.2 Install framing UTP cables to connect the telecommunications areas between them, as shown on the plans, and in accordance with the article "CABLE DRAW".

.3 During the vertical passage of framing cables between telecommunications areas, firmly secure the cables to the wall using appropriate fasteners when they are not in conduit while taking care to compress them the least possible.

3.4 MOUNTING PLATES AND MODULAR PLUGS

.1 Provide a mounting plate or adapter (as appropriate) for each of the telecommunications outputs shown on the drawings.

.2 Install the mounting plates and the mounting adapter modular jacks required for each output shown in plan in accordance with the model and color code defined in this section.

.3 Close unused openings of the mounting plates and adapters compatible with modular plugs of the same color.

.4 Connect a UTP cable to each of the sockets installed according to designation T568A prescribed by ANSI/TIA-568-C.

.5 Install the mounting plates and adapters on each of the outputs.

3.5 TELECOMMUNICATIONS AREAS

.1 Provide that the active equipment (which is provided by the Owner) must be installed before you can complete any connection to it and it will be installed only when the site conditions permit, at the end of the project.

.2 Use all hardware and supports provided for the project in order to achieve a clean, organized installation.

.3 In each of the areas of telecommunications, the distribution of cables with garter wires between dispatchers strips will be performed by the communications Contractor.

3.6 IDENTIFICATION

.1 Identify all wiring network elements. Refer to Section 27 10 06 – Structured wiring – Administration of installation.

3.7 TESTING – GENERAL

.1 Communications Contractor must notify the client representative at least 24 h in advance before each test so that they can attend.

.2 If the communications Contractor fails to notify the Owner's representative within the agreed period, it will redo all the tests at their expense.

.3 Provide the Engineer and the Owner, all the results, in digital format, of audits conducted.

.4 Telecommunications Contractor must correct at his own expense any defect observed in the tests and replace defective equipment, redo all the checks and tests, and put into digital format, all the results of audits sent to the Engineer and the client.

.5 Perform all other tests required by the manufacturer for the issuance of the warranty certificate.

3.8 TESTING – PTNB CABLE

.1 To ensure that the performance of cables meets the requirements of this section, check these with a wiring device certified for testing.

.2 Communications Contractor to perform all tests for category 5e and 6 wiring with a certified III minimum apparatus.

.3 Communications Contractor will perform all tests for category 6A wiring with a certified IV apparatus.

.4 Before checking cables, the communications Contractor must perform the calibration between the main station and the remote station of the cabling certification unit.

.5 Communications Contractor must give the Engineer the make and model of the device wiring certifications and a copy of the last calibration of the device by the manufacturer.

.6 Unless otherwise indicated, the tests must be of "permanent link".

.7 In order to verify the accuracy of the length of UTP links, the communications Contractor must ensure that the wiring certifying apparatus is calibrated to the rated velocity of propagation (NVP) corresponding with that specified by the manufacturing wiring.

.8 The following checks must be made on UTP cables and should not be considered as limiting the telecommunications Contractor:

.1 Open circuits and short circuits (head and neck of each pair).

.2 Short circuits (head of each pair and ground).

.3 Mix/Reverse pairs.

.4 Electrical/electromagnetic noise can disrupt the transmission of data on the Ethernet network, modem or telephone. This test must be performed with all the lights on.

.5 Length.

.6 Attenuation.

.7 Crosstalk, para-crosstalk (NEXT, PSNEXT, ELFEXT, PSELFEXT).

.8 Alien crosstalk.

.9 Return loss (RL).

.10 Propagation delay.

.11 Difference in propagation delay ("delay skew").

.12 Attenuation crosstalk ratio (ACR).

END OF SECTION

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Part 1 General

1.1 REFERENCES

.1 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC-S524-06 – Standard for the Installation of Fire Alarm Systems.

.2 CAN/ULC-S525-07 – Audible Signal Devices for Fire Alarm Systems, Including Accessories.

.3 CAN/ULC-S527-99 – Standard for Control Units for Fire Alarm Systems.

.4 CAN/ULC-S529-09 – Smoke Detectors for Fire Alarm Systems.

.5 CAN/ULC-S531-02 – Standard for Smoke Alarms.

.6 CAN/ULC-S536-04 – Inspection and Testing of Fire Alarm Systems.

.7 CAN/ULC-S537-1997-04 – Verification of Fire Alarm Systems.

.2 The system must comply with:

.1 Chapter I of the Building Code of Québec and Safety Regulations in Public Buildings in Quebec.

.2 Chapter V - Electricity Construction Code of Québec.

.3 In the by-laws of the City or Longueuil, Borough of Saint-Hubert.

1.2 DOCUMENTS TO BE SUBMITTED FOR APPROVAL / INFORMATION

.1 Submit the required documents and samples, in accordance with section 20 00 10 – Mechanical and electrical general instructions.

.2 Shop drawings:

.1 The following elements must appear on the shop drawings:

.1 Details of the various devices.

1.3 QUALITY ASSURANCE

.1 Inspection tests must comply with CAN / ULC-S536 standard.

.2 Submit inspection report to Consultant.

1.4 UNFOUNDED FIRE ALARM (FALSE ALARM)

.1 For the duration of the work, the Contractor is responsible at all times for the proper functioning and continuity of the fire alarm system.

.2 Before the start of work, the Contractor must ensure that the fire alarm system has no faults (disturbances).

.3 All costs due to the triggering of an unfounded fire alarm (false alarm) must be defrayed by the Contractor.

.4 Non-exhaustive list of examples of unfounded fire alarm triggers (false alarm):

.1 Accidental testing and handling.
.2 System test without notifying the control panel where the system is connected.
.3 Failure to deactivate the system.
.4 Accidental triggering of a manual station in the work area.
.5 Construction or renovation work.
.6 Dust caused by the work.
.7 All other situations during the work.

Part 2 Product

2.1 MATERIALS

.1 Existing system:

.1 Manufacturer: Siemens.
.2 Model no.: XLS-V-R.
.3 Maintenance contractor: Stanex.

2.2 WIRING

.1 Copper conductors.

.2 Alarm trigger circuits: minimum 18 AWG wires, and according to manufacturer's requirements.

.3 Loudspeaker circuits: twisted pairs shielded and according to manufacturer's requirements.

.4 Mounting terminal block with identification.

2.3 AUTOMATIC ALARM TRIGGERING DEVICES

.1 Smoke detectors type photocell, pluggable, sensitivity adjustable locally , addressable, base with lamp built-in alarm with red indicator and connection terminals for relays to the indicator lights installed remotely, as indicated.

Part 3 Execution

3.1 EXAM

.1 Verification of conditions: before proceeding with the installation of the fire alarm and communications systems, ensure that the condition of the surfaces/supports previously implemented under other sections or contracts is acceptable and allows work to be carried out in accordance with the manufacturer's written instructions.

.1 Make a visual inspection of surfaces / supports in the presence of the Consultant.

.2 Immediately inform Consultant of any unacceptable condition detected.

.3 Begin installation work only after correcting unacceptable conditions and receiving written approval from Consultant.

3.2 INSTALLATION

.1 Install detectors at locations indicated and connect to fire alarm circuits. The detectors must be placed more than 1 m from the air outlets. For ceiling mounted detectors, leave a clearance with a radius of at least 600 mm around and above the detector. Air duct detectors must be installed in a straight section of duct.

.2 Install speakers and connect them to speaker circuits.

.3 Perform installation in accordance with latest edition of ULC-S524.

3.3 CONDUIT AND CONDUCTORS

.1 Install all conductors in metal conduits with rigid steel thin-walls, unless otherwise specified in the plans or in this estimate.

.2 Install all conduits, pursuant to Section 26 05 34.

.3 Install conductors for detection and telephone lines in separate conductors for the speakers and bells.

.4 Fill the conduits such that the total area of the conductors does not exceed 40% of the free space inside the conduit.

3.4 ON-SITE QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.01 and the latest edition of the CAN/ULC S537.

.2 Fire alarm system:

.1 Test all alarm devices and circuits to ensure that manual alarms, smoke detectors transmit an alarm to the switchboard main control and trigger a first stage alarm.

.3 Test the sound levels of alarm signals in each room and record the levels measured in the verification report.

.1 Perform initial speaker adjustment to ¼ W in closed offices and to 1 W everywhere else.

.2 During testing, increase power as needed to pass test.

.4 At the end of the verification, send to the Consultant:

.1 A certificate attesting that this work has been carried out.

.2 A complete register of equipment and verification on two (2) separate forms.

.1 The first, including the quantity of signs, zoning, announcers, manual stations, printers, cathode ray screens, detectors and combustion products, etc., on the project.

.2 The second, including all the equipment described in the previous paragraph, but listed individually, indicating the location of each device, the date of the inspection, as well as any deficiencies discovered during the inspection and date the re-inspection took place, after the changes, the voltage at which each detector was calibrated for future reference.

3.5 MAINTENANCE

.1 Provide a one (1) year maintenance service, including two (2) inspections by the manufacturer, during the warranty period.

.2 Give, on the bid form, a separate price covering temporary modifications made to the software during the course of the work, including modifications to zoning labels, various control functions and system operation.

END OF SECTION