

**CORRECTIONAL SERVICE OF CANADA
PORT-CARTIER**

OUTDOOR COURTYARD

PROJECT CIMA: Q192756A

**MECHANICAL AND ELECTRICAL
SPECIFICATIONS**

SUBMITTED FOR TENDER

2019/08/30


**CORRECTIONAL SERVICE OF CANADA
PORT-CARTIER**



MECHANICAL AND ELECTRICAL SPECIFICATIONS

OUTDOOR COURTYARD

Project n° Q192756A

Prepared by: Jean-Yves Mercier, techn.


: _____
Remy Lemay, eng.
O.I.Q. member N°: 5000670
2019-08-30

Verification by: 


Nicolas Gagnon, eng.
O.I.Q. member N°: 5039084



1145, Lebourgneuf boulevard
Desk 300
Quebec (Quebec)
G2K 2K8

2019-08-30

Revision n°	Submitted for	Date
0	Tender	2019-08-30

Section N°	Title	Number of pages	Responsible Specialty
DIVISION 20 - CLAUSES GÉNÉRALES EN MÉCANIQUE-ÉLECTRICITÉ			
20 05 01	ME – General Requirements - General Contractor	16	All
20 05 05	ME- Installation of piping, conduits and ducts	5	All
20 05 53	Identification of fire protection networks and equipment	4	All
DIVISION 21 – FIRE PROTECTION			
21 05 01	Fire protection - Specific requirements	3	PI
21 05 05	Piping installation	1	PI
21 13 13	Water based automatic fire extinguishing systems	5	PI
DIVISION 22 - PLUMBING			
22 05 01	Plumbing - Specific requirements	3	P
22 05 05	Pumbing – Piping installation	3	P
22 05 29	Supports suspensions for piping and plumbing	4	P
22 05 93	Testing, adjusting and balancing plumbing systems	4	P
22 11 16.01	Domestic water piping-Interior-Metallic	4	P
22 13 17	Sanitary waste and vent piping- Cast iron, copper and steel	2	P
22 42 01	Plumbing specialties and accessories	2	P
DIVISION 26 - ÉLECTRICITÉ			
26 05 01	Electricity - Specific requirements	6	E
26 05 05	Electricity - Dismantling and demolition work	3	E
26 05 19	Building wiring	3	E
26 05 20	Wire and box connectors (0-1000 V)	1	E
26 05 33	Conduits, boxes and connectors	6	E
26 27 26	Wiring devices	4	E
26 28 16	Molded-case circuit breakers	2	E
26 51 13	Lighting equipment	4	E

END OF SECTION

Part 1 General

1.1 GENERAL

This section deals with common topics related to all sections dealing with mechanical and electrical work, especially sections 21 to 26 inclusively.

General and particular specifications, appendices, workforce regulations, owner's documents, architect's general and particular conditions as well as other documents found in the bid form an integral part of this section and govern the work.

1.2 REFERENCE STANDARDS

The entire work must be carried out in compliance with the current edition of the Quebec Construction Code, with all revisions imposed by decree in this document as well as all standards listed in this document, according to the article "« Documents incorporés par renvoi et organismes cités»".

In some cases, when stated in the particular sections of the specifications, a more recent standard is cited, this edition of the standard shall be applied.

1.3 ASSIGNMENT OF SPECIALIZED WORKS IN ELECTROMECHANICS BY SPECIALTY

Various specialized electromechanical works are performed by "specialties" as defined herein.

The company in charge of the so-called "specialty" (see "Responsible Specialty" column in the **table of contents**) must ensure that it has all the qualifications required to meet all responsibilities assigned to it. In the event that the company does not hold all these qualifications, it will have to call on one or more companies with required qualifications in order to fulfill all of its obligations.

Nomenclature used in the table of contents of these specifications is defined according to the following legend :

Legend of the responsible specialties in electromechanics	
PI = Fire Protection	B = E.R.E. (Balancing)
P = Plumbing, heating and cooling	E = Electricity
V = Ventilation	TC = Communication Tech.
G = Geothermal	S = Security
RA = Automatic regulation	MP = Swimming pool mechanics
C = Insulation	

1.4 DEFINITION

- .1 The Contractor is the organization that signs a contract with the owner to perform all work shown in the plans and specifications. The Contractor must supply, erect, install and commission all the elements described herein.
- .2 The term " General Contractor " is also used to refer to the Contractor.
- .3 The Contractor has recourse to specialties (subcontractors) to perform certain work as defined in paragraph 1.3. These operate under responsibility and supervision of the Contractor as if they were part of his organization. The Contractor is therefore the only party authorized to have communications, requests, etc., with the owner or his professionals.

1.5 OBLIGATIONS AND ROLE OF CONTRACTOR CONCERNING SPECIALTIES OF MECHANICS AND ELECTRICITY

- .1 The Contractor is, by reason of his contract with the owner or agent, responsible for carrying out the construction of the project. This includes all specialties of mechanics and electricity.
- .2 Thus, he must see to the execution of works according to plans and specifications.
- .3 This includes all the coordination required between all specialties in order to integrate each element stipulated in his contract. This is as much mechanical and electrical elements as architectural and structural elements.
- .4 Administrative as well as technical management are part of his mandate and it is his responsibility to take all decisions and measures required to arrive at the desired result.
- .5 The Engineer may, if necessary, be requested during site meetings to validate Contractor's actions provided that the foregoing does not exceed obligations provided for in his contract binding him to the owner
- .6 The Contractor is responsible for making for yardage, on-site installation of equipment, arrangement of pipes, conduits and ducts in accordance with drawings issued for construction, standards and according to rules. For visible elements, the Contractor will coordinate the positioning with professionals concerned (architect, designer, owner, etc.).
 - .1 A set of plans outlining all necessary major devices and equipment accompany these specifications.
 - .2 The bid or construction plans indicate, in a general and approximate fashion, the location of the equipment and where will the pipes conduits and ducts pass., installed under this contract. Only dimensions given on the plans will prevail during the installation of the mechanical and electrical works. No other plans or installation drawings will be provided to the Contractor by the Engineer.
 - .3 Where pipes, conduits, ducts, etc., are shown on plans only in a diagram form, they shall be installed in such a way as to preserve free space and to minimize use of space in which they will pass.
 - .4 Before submitting his bid, the Contractor shall therefore ask architects and Engineers, all required clarifications. In addition, he must warn the Engineer of any inconsistency that may exist between plans and specifications of the Engineer and the architect if applicable.
 - .5 Specifications do not necessarily mention all materials and equipment indicated on the plans and vice versa. However, it is understood that the Contractor agrees to supply and install all these materials, as if they were both mentioned on specifications and on plans.
 - .6 In cases where two descriptions of equipment or materials do not agree, either on plans or specifications, the Contractor shall include in his bid the most demanding description of both.
 - .7 When installing equipment, the Contractor shall provide the required clearances for maintenance. These clearances will have to be coordinated with the other subcontractors in order not to handicap these spaces by other installations.
- .7 The Contractor must consult all available project documents and ensure that interdisciplinary coordination has been done and respected before requesting a change or a directive.
- .8 The Contractor may question professionals for items or subjects for which he does not find a response to documents or for which there is a doubt in his mind.

- .9 If the Contractor, in the course of work, sees a potential for improvement to be made at the same cost, he will be welcome to propose it to the Engineer.
- .10 Specialty Manager
 - .1 For each specialty, a specialty manager will be identified and will be the person responsible of specialty. This individual will be part of the Contractor's staff or his subcontractor. He is the one who places orders for materials and equipment from manufacturers.
 - .2 He must ensure that he provided each of his suppliers with all information, details and requirements that apply to the supplies that this supplier will have to satisfy.
 - .3 Where specifications or plans indicate that one or more accessory items must be provided with an equipment, it is not acceptable that such items or accessories are provided by others. This is to ensure compatibility, appearance, performance, etc. of the whole assembly.
- .11 Specialist Foreman
 - .1 Each specialty will be represented on the site by a foreman. The latter will be responsible for execution of work as specified within plans and specifications.

1.6 CONDITIONS REGARDING PRODUCTS AND SERVICES

- .1 Bidders must prioritize the purchase of products manufactured in Quebec and in provinces or territories that have signed an intergovernmental agreement with Québec.
- .2 Also, the selected Contractor must only hire subcontractors who have an establishment in one of the signing provinces which has permanent facilities and the required personnel to carry out the work. In addition, any organization working on site shall hold a license of the RBQ for the appropriate work to execute.

1.7 ACCEPTABLE PRODUCTS

- .1 General

Acceptable products are usually identified in plans and / or specifications. All acceptable products will be supplied and installed in new condition. This identification takes three forms:

 - .1 Reference Product

This product is named at the top of the list. This product is accompanied by a name or product number, equipment number, etc., a model or catalog number, or other specific designation. This product is the reference product and is the one with which the project plans and specifications have been prepared.
 - .2 Equivalent Product
 - .1 Names of manufacturers, suppliers, etc., named after the reference product are deemed to be recognized suppliers and, if their products meet physical characteristics, performance, efficiency, appearance, etc., they may be submitted in equivalence (see " Equivalent " clause) and must be submitted thirty (30) days after contract award.
 - .3 Substitute Product
 - .1 A substitute product is a product whose name was not mentioned in specification where equipment are described, but the mention " or equivalent " has been written.

- .2 When the mention " or approved equivalent " has not been written down at the description of equipment, the Contractor shall be required to provide the equipment whose manufacturer names are named in the description of the product.
 - .3 An equivalence **request** must be submitted for alternate product within thirty (30) days of contract award. In this request, the Contractor must justify its procedure with serious and verifiable arguments.
 - .4 In his equivalence **request**, the Contractor shall demonstrate quality, reliability and provenance of the proposed product.
 - .5 Once the equivalence **request** has been received, the Engineer, in consultation with the owner, will study it and will pronounce its decision, favorable or not, in writing and the decision will be final.
 - .6 If the **request** is accepted, the Contractor may undertake the " Equivalent " procedure.
- .2 Equivalent procedure
- .1 The product is manufactured, supplied, etc., by one of manufacturer, supplier, etc., named in plans and / or specifications following the reference product.
 - .2 The Contractor's bid must be based on the reference product.
 - .3 The Contractor's bid may be based on equivalent product desired by the Contractor. However, the Contractor who uses an equivalent product to establish his bid assumes the risks, and in case of refusal, will not receive any financial compensation, delay or other. On the other hand, if the equivalent is accepted, no credit or other compensation will be required.
 - .4 . The Contractor is responsible for all impacts on other specialties or other participants as well as impacts on his own installation. He will incur all costs including modifications to calculations, plans, various connections, control or operation sequences, operating protocols, etc. Acceptance of an equivalence request or substitution does not relieve the Contractor of his responsibility to provide a product meeting the requirements of the contractual documents in every respect.
 - .5 The equivalent must be presented with all necessary elements for the Engineer to assess the relevance. For equivalents with more technical content, a comparison table between reference product and proposed equivalent product must accompany the presentation. This table will highlight all dimensional elements, arrangement, installation and connection, consumption, clearances, etc. For elements having an impact on appearance, provide, for the architect or the Engineer, all the necessary elements to make the analysis and base a judgment. In case of products that have an impact on the aesthetics of the building such as fixtures, plumbing fixtures, heaters, grilles and diffusers, etc. It is possible that the proposed equivalent may be refused for reasons of integration and respect of architectural design.
 - .6 Submit to study for acceptance only one equivalent per product and only once. In case of refusal, the Contractor must provide the reference product.
 - .7 The Engineer will be the sole judge of the equivalent and his decision will be final and without appeal.
 - .8 « Approved equivalent applies at the end of each list of manufacturers and / or products specified in these specifications and drawings.
- .3 Alternative
- .1 This is an exceptional situation that does not meet any of the previous three categories.

- .2 The Contractor who wishes, in order to improve the project, to present an alternative solution may present it to the Engineer accompanied by a file justifying and explaining the proposal.
- .3 . The intention to undertake such a procedure shall be announced to the Engineer within fifteen (15) days of awarding the contract and a presentation file must be submitted within the next fifteen (15) days.
- .4 In his presentation file, the Contractor will put forward his technical, financial, scheduling, constructive arguments, etc. and monetary benefits granted to the owner.
- .5 This alternative will be studied by the Engineer in conjunction with the owner and a decision will be made.
- .6 . As this is an exceptional situation, the rest will be negotiated and agreed by all parties.

1.8 DESIGN, IMPLEMENTATION AND CERTIFICATION OF SEISMIC MEASURES

- .1 All mechanical and electrical work must meet requirements of the latest version in force of the Quebec Construction Code concerning earthquake protection. In this regard, each specialty must obtain services of a specialist, Engineer in good standing of the Ordre des Ingénieurs du Québec, to perform calculations, specify the supports and their arrangement as well as supervise execution of the entire work to ensure its compliance with the Quebec Construction Code.
- .2 On completion of work, for each specialty where this is applicable, a report certifying conformity of the entire work with the Québec Construction Code will be produced by the specialist Engineer, then delivered to the owner through the Engineer. This report should, at a minimum, contain the following details:
 - .1 A complete identification of the project :
 - Title of the project
 - Location of the works: address, floor, sector, name of department concerned, etc.
 - Certification that all the works, systems, supports and other components installed by the Contractor meet the requirements of the Québec Building Code concerning earthquake protection.
 - Operations and maintenance manual should also include equipment and accessories that have been added as a change order
 - .3 In order to establish its specifications, the specialist Engineer must make sure to consider the correct risk category to which the specific project installations must conform. As complementary information, the following information can be used as inputs:
 - .1 Project is located in the town of Port-Cartier
 - .2 Affected building is a civil protection building within which components and systems must remain in place AND in operation during and after an earthquake without major repairs.
 - .3 Methods principles and materials for fastening and support shall comply with or be similar in construction to the materials specified in various sections of this specification. Depending on the specialty, pins, wires or strips of metal are not acceptable.

1.9 REVIEW OF DRAWINGS AND SITE

- .1 Properly review drawings and site of proposed work to fully understand all local conditions that may affect performance of the contract.

- .2 No compensation or supplement will be granted to cover the errors, omissions or interference that could have been detected before the start of work by a serious examination of drawings and existing conditions at the scene.
- .3 Before submitting a bid, the Contractor shall examine the location, where the work is to be carried out, what is the location of existing buildings and will study the local conditions that affect the work of this contract. No additional compensation will be awarded for the consequences of his negligence in making this examination.
- .4 The Contractor will carefully study the structural drawings and architectural drawings to ensure that the work of this project can be satisfactorily performed without changes to the building, as indicated on the plans. Also, before commencing work, he will review the work of other trades and report to the Engineer any defect or impediment to the performance of the work described in these specifications or under the required warranty.

1.10 ADDITIONAL WORK TO THE CONTRACT

- .1 The owner, through his professionals, may authorize changes to the Contractor's contract.
- .2 These changes may affect the value of the contract more or less.
- .3 These changes will only take effect on the issuance of a change ordered by the owner and no work can be undertaken before this issuance.
- .4 In extreme cases, it may be authorized by the owner or his professionals to proceed immediately, pending confirmation by order of subsequent change.
- .5 Value of any change to the contract is determined based on an actual cost according to a detailed estimate that lists quantities, actual unit cost (which is the cost of the list price and the actual rebate obtained from the supplier), time of hand -work according to recognized scales and unit cost thereof including all social security contributions prescribed by the RBQ, equipment costs (taxes, customs, transport, etc.). These additional costs will be reduced by the costs avoided including labor.

For any change, a supervision cost (foreman) may be considered only on the basis of time difference allocated in the general construction schedule for execution of the work involved.

For work where integration or fabrication drawings have been prepared, submitted and verified by the Engineer, an amount for review time of these drawings will be allocated. A maximum amount corresponding to 10 % of cost for basic equipment modified by this revision will be authorized (such as pipes, fabricated sheet, etc.). Additional equipment costs, more or less, are not part of the basic equipments.

Applicable markup following the definition of cost for work performed by a subcontractor under the Contractor's supervision will be 15 % for this subcontractor and 10 % for the Contractor. For work performed by the Contractor, increase will be 15 %.

In some very special cases where a specialty has to have the work performed by subspecialty itself, increase applicable to true costs of this one will be 15 %, 10 % for the specialty and 10 % for the Contractor.

Real costs attributable to change are :

- .1 wages and social benefits paid to workers in accordance with an applicable collective agreement; similarly, wages and social benefits paid to the foreman and, where applicable, to the superintendent who supervises employees on the work site, to the extent that the work of the latter is carried out outside worksite hours provided for in the contract documents;

- .2 travel and accommodation expenses for additional required employees;
 - .3 cost of all materials, products and supplies, including materials incorporated into the work due to a change in work, including transportation, storage and handling fees, all in accordance with lowest price awarded to the Contractor and subcontractors;
 - .4 taxes and other charges imposed on the labor by any competent authority, materials and equipment required and to which the Contractor is subject to, excluding Goods and Services Tax (GST). and Québec sales tax (QST);
 - .5 cost of transportation and use of additional equipment and tools required, other than those used by employees;
 - .6 additional cost of quality control for work related to changes by the quality enabler or superintendent;
 - .7 applicable royalties and patent rights;
 - .8 additional premiums for bonding and insurance that the Contractor must pay as a result of increase in the price of his contract;
 - .9 energy and heating costs directly attributable to the change;
 - .10 cost of removal and disposal of garbage and debris attributable to the change;
 - .11 protections, temporary installations and additional security-related work needed;
 - .12 any other cost of labor, materials and additional required equipment, not specified in the foregoing paragraphs, attributable to execution of the change and which can not be assimilated to overheads and costs of administration.
- .6 Markup percentage applicable to real costs includes :
- .1 general, administrative and profits;
 - .2 fees for communication equipment;
 - .3 cost of using means of transportation or rentals other than those specifically required for materials;
 - .4 fees incurred for estimations , administration, etc. for staff other than those at the site;
 - .5 power tools and manuals of common use in its specialty.

When there is a mismatch with the markups set out in general conditions (Division 01), those of general conditions will prevail.

1.11 COORDINATION BETWEEN SPECIALTIES

Note : These are drawings showing the behaviour of all trades and not plans for making only tinshop.

- .1 To ensure full cooperation with all trades involved in this work, each specialty in building mechanics will have to verify the plans of other specialties and coordinate its work to ensure that its equipment does not conflict with those of other trades before starting work. No addition to contract will be granted for a breach of this term.
- .2 The " ventilation " specialty has priority over other Contractors to pass conduits. However, the Engineer will have the right to intervene if it is judged that it delays the work.

- .3 The coordination and verifications mentioned above will be made by the Contractor and his subcontractors before ordering each equipment, as well as before starting to perform any work. If a difficulty arises, he must present the case to the Engineers before starting work. If this verification is not done by the specialty and a difficulty arises and the specialty must incur additional costs to overcome it, the subcontractor will undertake these costs.
- .4 Unless otherwise specified, necessary accessories must be provided to complete on-site installation of the items he has manufactured.
- .5 No compensation is granted for moving conduits, boxes, equipment, etc. affecting proper performance of other work or general appearance.
- .6 . Each specialty will coordinate its openings, anchors, supports and other provisions required for installation of the mentioned works and will obtain information required in time not to delay the execution of the work.

1.12 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit required documents and samples
- .2 Technical sheets must be submitted as follows :
 - .1 Materials technical sheets having an impact on aesthetics and identified in plans and / or specifications as such will be presented to the architect first. The Contractor must ensure that this procedure is followed so as not to create a delay in his work.

When there is a choice of finish and color, for all apparent equipment, this choice will be made by the architect among the standard colors of the manufacturer unless otherwise indicated in plans and specifications of the Engineer and / or the architect. The Contractor must therefore verify with the architect the choice of finish and color desired by the latter according to its architectural concept

Once the data sheets are reviewed and annotated as " accepted " or " compliant " by the architect from an aesthetic point of view, the sheets will be returned to the Contractor and he will send them to us for the technical verification of the product.
 - .2 Prepare and transmit for each product, a description form attached as Appendix " C " and entitled " Data Sheet and Drawing - Product Identification and Details "
 - .3 Submit to the Engineer for conformity verification detailed data sheets of each piece of equipment to be supplied, with all the characteristics mentioned in the specifications, as well as the name of the project. **Each shop drawings will be submitted in one hard copy or PDF, which will be returned to the issuer in " PDF " format by email. This e-mail copy will be replicated by the Contractor in sufficient number for preparation of maintenance requirements given to the owner. Each equipment or equivalent must be presented by an individual PDF file. In addition, the Contractor must update the shop drawing listings provided by the Engineer on each transmission.**
 - .4 . Data sheets must be customized to the project and include a space free of any drawing or writing of 60 mm x 60 mm for their approval.
 - .5 . Each sheet submitted for verification must be identified by means of markers highlighting the proposed equipment and their components. Sheets without such evidence will be returned without verification to the Contractor for resubmission in accordance with this requirement and the Contractor will be responsible for any delays.
 - .6 Provide samples upon request.

- .7 The production of the equipment must not begin before verification of the technical sheets by the Engineer.
 - .8 Data verification relates only to arrangement and the general construction of equipment and does not constitute a validation of all construction details, nor a quantity validation, dimensions, etc., of which verification remains the responsibility of the subcontractor. This verification does not relieve the subcontractor of responsibility for errors, information, dimensions, quantities, etc. shown on these drawings and to modifications to the drawings and specifications which were not reported in writing to the Engineer. The subcontractor is therefore responsible for ensuring that his installation meets performance requirements indicated in the plans and specifications.
 - .9 For each submitted data sheet or shop drawing, the Contractor must complete the shop drawings tracking sheet issued by the Engineer. This tracking sheet must be kept up-to-date by the Contractor in order to clearly visualize the dates of acceptance or rejection of shop drawings or data sheets.
- .3 Operations Manual
- .1 Presentation

The preliminary document for verification and the final document will be given to the Engineer in the following form :

 - 1. 1 hard copy
 - 2. 1 " PDF " electronic copy
 - .2 Operations and maintenance manual must be submitted and verified by the Engineer prior to provisional acceptance and will include the following sections :
 - 1. Technical manual
 - 2. Maintenance data
 - 3. Performance sheets
 - .3 Technical Manual

The manual will be edited by chapter and a table of contents will be prepared. This manual will include :

 - .1 A description of each system and its control / regulation / safety equipments.
 - .2 The circuit diagram of the control / regulation of each system.
 - .3 A description of operations of each system under various loads or season with procedure display, monitoring and set points changes.
 - 4. The instructions of operations for each system and component.
 - 5. A description of mesures to be taken in case of equipment/system failure.
 - 6. A table of valves, referenced on a flow diagram
 - 7. The color code.
 - .4 Technical sheets verified by the Engineer grouped in logical order and assembled with numbered separators.
 - .5 Maintenance data should include the following :
 - .1 Instructions for maintenance, repair, operation and troubleshooting of each component;
 - .2 A maintenance schedule specifying the frequency and duration of the tasks, as well as the tools necessary for their execution.

- .6 Performance data should include the following :
 - .1 Performance data provided by the equipment's / equipment's manufacturer, specifying the operating point of each, recorded after commissioning is complete;
 - .2 Performance test results of equipment / materials;
 - .3 All other performance data specified elsewhere in the contract documents;
 - .4 TAB (Test, Adjustment and Balancing) reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing HVAC Systems
- .7 Verification
 - .1 For verification purpose, submit to the Engineer a preliminary version of operations, maintenance and performance manual. Unless otherwise directed by the Engineer, technical sheets must not be submitted individually.
 - .2 If necessary, make required changes to the operations and maintenance manual and submit to the Engineer again.
- .8 Additional information
 - .1 Prepare additional information data and attach them to operations and maintenance manual if, during the training sessions mentioned above, it is realized that such data are needed.

1.13 DOCUMENTS TO BE KEPT ON SITE

- .1 The Engineer will provide, at the beginning and during the course of construction, one (1) electronic copy of the plans and specifications " issued for construction " or " revised ". Provide the number of copies required for each phase of the work and indicate, as and when, all changes made during execution of the work to the mechanical and electrical equipment and equipments, to control / regulation systems, to low voltage control wiring, etc
- .2 Report each week the information noted on individual copies on a master copy so that they show the mechanical systems and devices as they are actually installed.
- .3 Use an indelible ink pen of different colors for each system.
- .4 Keep these drawings on site and make them available to the persons concerned for reference and verification purposes.
- .5 Post- execution drawings
 - .1 Before proceeding to TAB operations (testing, adjusting and balancing for HVAC), complete "as-built" drawings.
 - .2 Identify each drawing in the lower right corner, in letters of at least 12 mm high, as follows "AS-BUILT" DRAWINGS: THIS DRAWING HAS BEEN REVIEWED AND SHOWS MECHANICAL AND ELECTRICAL SYSTEMS / EQUIPMENTS AS 'THEY ARE ACTUALLY INSTALLED" (Signature of the Contractor) (Date).
 - .3 Submit drawings to Engineer for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing of HVAC systems with "as-built" drawings in hand.
 - .5 Submit electronic copy of "as-built" drawings complete with operations and maintenance manual.

1.14 OPERATING AND MAINTENANCE PERSONNEL'S TRAINING

- .1 Provide qualified instructors to train operating personnel on the operation of mechanical and electrical equipment. Provide maintenance specialists to train operating personnel on maintenance and adjustment of mechanical equipment and any changes or modifications to equipments under the warranty.
- .2 Teach personnel designated by the owner or his operators, how to operate and proceed to maintenance of the facility. Establish a schedule of training sessions and have the staff sign following these sessions. Obtain the list of designated personnel from the owner.
- .3 Instructions must be given during normal working hours, before systems have been accepted and handed over to operating personnel.
- .4 Operations and maintenance manual shall be used for personnel training. Prior to the start of training, hand over a copy of the manual to the Chief Operating Officer, and remaining manuals to the owner.

1.15 KEEPING MATERIALS CLEAN

- .1 Using appropriate elements, prevent dust, dirt and other foreign matter from entering openings of facilities and equipment.
- .2 Provide protection of all materials against weather.
- .3 Ensure that throughout the course of construction, all conduits, pipes, ducts, etc. are kept hooded throughout their erection, so that no foreign material piles up in them.

1.16 CONCRETE WORKS

- .1 All concrete poured on site in connection with mechanical and electrical work such as equipment bases, beds, floating slabs, catch basins, ditches and drainage gutters, etc., will be provided and constructed under the general Contractor's responsibility unless otherwise indicated on drawings

1.17 WORKS IN EXISTING BUILDING OR SYSTEM

- .1 When specified on plans and specifications in a general or detailed fashion, perform the required work with reference to the following:
 - .1 When work is to be carried out in an existing building, each specialty will have to do all work on existing systems concerning its specialty. Work on existing systems includes among others, to remove all or partly, to change, to relocate the existing equipment, to put them in good condition, to reconnect them in whole or partly, to the modify, relocate existing equipment, restore it to good working order, reconnect all or part of it to new systems, so as to carry out the new work shown on drawings and specifications, in accordance with laws and regulations in force.
 - .2 Also, note that no additional specific drawings and specifications for existing systems will be transmitted. Take a tour of the premises, study carefully and become familiar with existing systems, as no additional fees will be granted to perform work on existing systems.
 - .3 All systems to be so removed or modified, must be so as not to affect operating parts of the existing building that will continue to be used during the work according to the needs of the owner.

- .4 Agree with the owner for periods of time available to make modifications and connection of new systems on existing systems.
- .5 Include in the total bid all temporary work required to complete the new work described on drawings and specifications even if not described or shown in these drawings and specifications.
- .6 Move all existing materials and equipment from the various systems belonging to its specialty that prevent or obstruct the work of other trades. All the elements used for the extension due to the displacement of the existing materials or equipment will have to be identical to those existing.
- .7 Execute work in existing building in a clean and neat manner, to avoid damage to walls, ceilings and floors. Restart of walls, restart of paint, butchering holes, etc., following the removal of existing appliances or other accessories, are carried out by the construction manager.
- .8 Materials from existing systems to be removed for new work shown on drawings shall not be reused unless otherwise indicated on drawings. Non-reused materials will be offered to the owner and those not retained will become the property of the Contractor who will have to dispose of them outside the premises.

1.18 CLEANING THE PREMISES

- .1 Upon completion of installation and performance review, remove surplus materials, waste, tools and equipment from site.

APPENDIX A

DATA SHEET AND PRODUCT IDENTIFICATION AND DETAILS

PROJECT:	
PROJECT CIMA+ N°	PHASE :

SPECIALTY OR SUBCONTRACTOR

CONTRACTOR :	
Address :	
Contact:	
Telephone : ()	Fax: ()
Email:	

SUPPLIER :	
Address :	
Contact:	
Telephone : ()	Fax: ()
Email:	

SPECIALTY (field) :	
Datasheet or drawing n° :	
Delivery time (after approval)	
DESCRIPTION :	
SUBMITTED PRODUCT	DRAWING ISSUED FOR :
AS IS: <input type="checkbox"/>	VERIFICATION : <input type="checkbox"/>
EQUIVALENT : <input type="checkbox"/>	INFORMATION : <input type="checkbox"/>
SUBSTITUTION : <input type="checkbox"/>	COORDINATION : <input type="checkbox"/>
	OTHER : _____

REFERENCE TO PLAN :	
REFERENCE TO SPECIFICATIONS:	
Section :	Article :
NOTES :	
REV. DATE OF ISSUE :	
OWNER :	

<input type="checkbox"/>	ARCHITECT

<input type="checkbox"/>	STRUCTURAL ENGINEER

<input type="checkbox"/>	MECHANICAL/ELECTRICAL ENGINEERS

<input type="checkbox"/>	

CONTRACTOR :	
Address :	
Contact:	
Telephone : ()	Fax: ()
Email:	

PROFESSIONAL VERIFICATION : (stamp)

SUBMITTED TO : (please check)

APPENDIX B

DOCUMENT TRANSMISSION JOURNAL

PRESSURE TEST REPORT

- | | |
|--|-----------------------------|
| <input type="checkbox"/> Domestic water system | Date of transmission: _____ |
| <input type="checkbox"/> Heating system | Date of transmission: _____ |
| <input type="checkbox"/> Cooling system | Date of transmission: _____ |
| <input type="checkbox"/> Steam / condensate system | Date of transmission: _____ |
| <input type="checkbox"/> Drainage system | Date of transmission: _____ |
| <input type="checkbox"/> Fire protection system | Date of transmission: _____ |
| <input type="checkbox"/> Gas system | Date of transmission: _____ |
| <input type="checkbox"/> _____ | Date of transmission: _____ |

RAPPORT DE NETTOYAGE DES RÉSEAUX NETWORK CLEANING REPORT

- | | |
|--|-----------------------------|
| <input type="checkbox"/> Domestic water system | Date of transmission: _____ |
| <input type="checkbox"/> Heating system | Date of transmission: _____ |
| <input type="checkbox"/> Cooling system | Date of transmission: _____ |

TRAINING CERTIFICATE

- | | |
|--|-----------------------------|
| <input type="checkbox"/> Plumbing | Date of transmission: _____ |
| <input type="checkbox"/> Heating | Date of transmission: _____ |
| <input type="checkbox"/> Cooling | Date of transmission: _____ |
| <input type="checkbox"/> Fire protection | Date of transmission: _____ |
| <input type="checkbox"/> Refregeneration | Date of transmission: _____ |
| <input type="checkbox"/> Ventilation | Date of transmission: _____ |
| <input type="checkbox"/> Regulation | Date of transmission: _____ |
| <input type="checkbox"/> Fire alarm | Date of transmission: _____ |
| <input type="checkbox"/> Power generator | Date of transmission: _____ |
| <input type="checkbox"/> Special systems | Date of transmission: _____ |
| (specify) : _____ | Date of transmission: _____ |
| <input type="checkbox"/> _____ | Date of transmission: _____ |

DOCUMENT TRANSMISSION FOR SPARE PARTS

- | | |
|-----------------------------------|-----------------------------|
| <input type="checkbox"/> Specify: | Date of transmission: _____ |
| <input type="checkbox"/> Specify: | Date of transmission: _____ |
| <input type="checkbox"/> Specify: | Date of transmission: _____ |

LETTER OF CONFORMITY OF PARASISMQUIES SYSTEMS

- | | |
|---|-----------------------------|
| <input type="checkbox"/> Plumbing / Heating / Cooling | Date of transmission: _____ |
| <input type="checkbox"/> Fire protection | Date of transmission: _____ |
| <input type="checkbox"/> Ventilation / Air Conditioning | Date of transmission: _____ |
| <input type="checkbox"/> Electrical / Lighting | Date of transmission: _____ |

TEST AND BALANCING REPORT

- | | |
|---|-----------------------------|
| <input type="checkbox"/> Power generator | Date of transmission: _____ |
| <input type="checkbox"/> Ventilation system | Date of transmission: _____ |
| <input type="checkbox"/> Heating system | Date of transmission: _____ |
| <input type="checkbox"/> Cooling system | Date of transmission: _____ |
| <input type="checkbox"/> Fire alarm system | Date of transmission: _____ |
| <input type="checkbox"/> Équilibrage des phases Phase balancing | Date of transmission: _____ |

OPERATION AND MAINTENANCE MANUAL (including DDC items)

- | | |
|---|-----------------------------|
| <input type="checkbox"/> Plumbing | Date of transmission: _____ |
| <input type="checkbox"/> Heating | Date of transmission: _____ |
| <input type="checkbox"/> Cooling | Date of transmission: _____ |
| <input type="checkbox"/> Fire protection | Date of transmission: _____ |
| <input type="checkbox"/> Electricity | Date of transmission: _____ |
| <input type="checkbox"/> Ventilation / air conditioning | Date of transmission: _____ |
| <input type="checkbox"/> Special systems | |
| (specify) : _____ | Date of transmission: _____ |
| <input type="checkbox"/> Specify: _____ | Date of transmission: _____ |

GUARANTEE LETTER

- | | |
|---|-----------------------------|
| <input type="checkbox"/> Plumbing / Heating / Cooling | Date of transmission: _____ |
| <input type="checkbox"/> Ventilation | Date of transmission: _____ |
| <input type="checkbox"/> Fire protection | Date of transmission: _____ |
| <input type="checkbox"/> Refregeration | Date of transmission: _____ |
| <input type="checkbox"/> Fire alarm | Date of transmission: _____ |
| <input type="checkbox"/> Power generator | Date of transmission: _____ |
| <input type="checkbox"/> Special systems | |
| (specify) : _____ | Date of transmission: _____ |

PLANS AS BUILT

- | | |
|--|-----------------------------|
| <input type="checkbox"/> Plumbing | Date of transmission: _____ |
| <input type="checkbox"/> Heating | Date of transmission: _____ |
| <input type="checkbox"/> Cooling | Date of transmission: _____ |
| <input type="checkbox"/> Fire protection | Date of transmission: _____ |
| <input type="checkbox"/> Ventilation | Date of transmission: _____ |
| <input type="checkbox"/> Regulation | Date of transmission: _____ |
| <input type="checkbox"/> Refregeneration | Date of transmission: _____ |
| <input type="checkbox"/> Electricity | Date of transmission: _____ |
| <input type="checkbox"/> Specify: _____ | Date of transmission: _____ |

OTHER SPECIFIC DOCUMENTS

- | | |
|---|-----------------------------|
| <input type="checkbox"/> " DAR " test certificate | Date of transmission: _____ |
| <input type="checkbox"/> Fire alarm | Date of transmission: _____ |
| <input type="checkbox"/> Gas purity test | Date of transmission: _____ |
| <input type="checkbox"/> | Date of transmission: _____ |
| <input type="checkbox"/> | Date of transmission: _____ |
| <input type="checkbox"/> | Date of transmission: _____ |

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

- .1 Section includes:
 - .1 Installation method for piping, conduits and accessories

Part 2 Products

2.1 PRODUCTS

- .1 Refer to particular sections that deals with them individually.

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 For piping, use unions or flanges to isolate equipment from piping system and to facilitate maintenance and assembly / disassembly of components.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.
- .4 Use plastic-lined flexible conduits and connectors suitable for electrical connection or control of motors or other equipment that may vibrate or move.

3.2 CLEARANCES

- .1 Provide clearances prescribed by standards in force.
- .2 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer
- .3 Provide space for disassembly, removal of equipment and components without interrupting operation of other systems, equipment or components. Space must be of dimensioned in accordance with drawings or the manufacturer's recommendations, whichever is higher
- .4 Each Contractor will be responsible for ensuring that required clearances are respected by him and other Contractors. These spaces will have to be coordinated towards the work site and in case of non-respect of clearances the Contractor at fault having encroached the space will have to relocate his installation at his expenses.

3.3 ELECTRICAL CONDUIT INSTALLATION

- .1 Refer to particular sections dealing with them individually.

3.4 OPENINGS AND PIERCINGS

- .1 All openings less than or equal to 150 mm required for passage of piping and conduits through walls, partitions, floors, beams, etc., except those specifically indicated in structural drawings, will be carried out by the specialized Contractor concerned. All openings greater than 150 mm shall be provided by the division responsible for the construction of walls, partitions, floors, beams, etc., but shall be coordinated by the sections of this division.
- .2 In existing walls, partitions, floors, beams, etc., or in which it was not possible to leave an opening, make required openings up to a diameter of 150 mm, using a dry rotary drill with an appropriate bit or cutter, or any other equipment approved by the Engineer.
- .3 No opening may be made in a beam, truss, column or any other structural element without the authorisation of the structural Engineer.
- .4 Openings will be of the size required for installation of sleeves. These sleeves shall be dimensioned taking into account the elements passing through it, required insulation and fire protection system

3.5 SLEEVES

- .1 Where fire resistance is prescribed
 - .1 Work in masonry, concrete or drywall
 - .1 Through floors, use sleeves made of black steel pipe, Series 10 or higher. Weld 19" wide locating angles in such way that, resting on the floor, the sleeve exceeds the floor by 50".
 - .2 Install sleeves through masonry and concrete wall or partitions and as indicated. Use sleeves made of black steel pipe series 10 or higher. These sleeves shall be flush to the finished surfaces
 - .3 For electrical work, through fire-rated internal partitions, only use sleeves for shielded bars, gutters and cableways. However, ensure the fire stopping sealing (See sealing clause).
- .2 Where no fire resistance is prescribed
 - .1 On foundation walls, use sleeves made of black steel pipe, series 10 or higher. An annular water cutter of 50 mm will be welded at mid-length.
 - .2 Through floors, use sleeves made of black steel pipe, Series 10 or higher. Weld 19" wide locating angles in such way that, resting on the floor, the sleeve exceeds the floor by 50".
 - .3 Install sleeves through masonry and concrete wall or partitions and as indicated. Use sleeves made of black steel pipe series 10 or higher. These sleeves shall be flush to the finished surfaces
 - .4 Sleeves are not required through internal partitions of drywall. The drywall material must have been carefully installed and the annular gap must not exceed 6 mm.
 - .5 For electrical work, through internal partitions without fire-rating, provide sleeves only for shielded bars, gutters and cableways. Provide soundproofing seal for open spaces or the interior partition.
- .3 Free Space
 - .1 Leave an annular gap of 6 mm between the sleeve and the pipes or between the sleeve and the insulation

- .4 Caution
 - .1 An element installed without an intended sleeve will not be considered sufficient reason, the element must be removed in order to install the sleeve.

3.6 WHERE RESISTANCE IS PRESCRIBED

- .1 Where fire resistance is prescribed
 - .1 In walls or floors where a level of fire-rating is required, the clearance between steel sleeves, pipes and conduits as well as between ducts and fire separations shall be sealed with fire-resistant materials that must remain in place and prevent the passage of flames and fumes when exposed to fire, as described in the N.B.C. standard. This sealant is approved for this purpose. or other approved technique.
 - .2 When pipes or conduits passing through floors are made of material that does not retain its shape, when subjected to intense heat (plastic for example), install a firestopping assembly approved according to the prescribed procedure. Such assembly shall be installed where prescribed by the approval.
 - .3 When pipes or conduits passing through walls or partitions, with or without a sleeve, are made of material that does not retain its shape when subjected to intense heat (eg plastic), install approved firestopping assembly approved according to the prescribed procedure. Such assembly shall be installed at where prescribed by the approval.
 - .4 For electrical installations, install appropriate fire stops.
 - .5 For conduits, use the same method used for pipes described above. For the shielded bars, use a section incorporating a firestop barrier and the perimeter shall be sealed with sealant approved for this purpose. For cable trays, use a removable material such as approved bricks.
 - .6 These firewall materials shall be installed per ULC approved fixtures identified by SP (Number) "Service Penetration Assemblies".
 - .7 The Contractor shall require from its supplier of firewall materials, technical bulletins corresponding to the firewall materials to be used with the ULC listing and the " SP " number corresponding to the assembly to be carried out on site.
- .2 Where no fire resistance is prescribed
 - .1 Fill annular gap between pipes, conduits and ducts and a sleeve with glass wool compressed in place and covered on each side with a suitable elastomeric sealant.
 - .2 Fill annular gap between pipes, conduits and drywall partition material with appropriate compliant elastomeric sealant.
- .3 Gastight Sealing
 - .1 Any passage between a parking lot, a boiler room, a refrigeration mechanic room or other areas likely to have gas releases or smoke and occupied space, must be installed, on each side of a wall or a floor or slab, a gastight seal.
 - .2 Sealant shall be compatible with adjacent materials. It will have to be and remain flexible in the long run. The product data sheet will be submitted to the Engineer for approval.
 - .3 This seal shall meet the " 25 " flame propagation and " 50 " smoke generation index.

3.7 INSPECTION DOORS

- .1 Supply inspection doors in ceilings or partitions, whether shown on the drawings or not, in order to allow maintenance of material and accessories, or inspection of safety, control or fire protection equipments.
- .2 Inspection doors for mechanical equipment will be supplied under Division 21, but installed by the specialty who installs ceilings, walls and floors. In areas where several traps are required, their arrangement will be submitted to the Engineer for approval.
- .3 Unless otherwise indicated, inspection doors will be mounted flush and be 600 mm x 600 mm for an entrance opening and 300 mm x 300 mm in the case of a hand opening. They must open 180° and have rounded corners. They will have hidden hinges, screwdriver locks and fastening hardware. Steel shall be coated of primer and doors must come from a recognized supplier who publishes technical documentation.
- .4 Acceptable product: Cendrex model « AHD », Can-Aqua series CA-UA or equivalent, except for those installed in fire divisions, which will be Cendrex model « PFN », Can-Aqua series CA-FR-U or approved equivalent.

3.8 OTHER PLACES

- .1 Fill annular gaps between pipes, conduits and ducts with glass wool compressed in place and covered on each side with a suitable elastomeric sealant.

3.9 TEMPORARY MEASURE

- .1 Temporarily seal all openings made during work while waiting for pipes, conduits and ducts to pass through.

3.10 FACING COLLARS (ESCUTCHEONS)

- .1 Supply and install facing collars where pipes and conduits pass through walls, partitions, floors and ceilings where required to complete the work in a clean and neat manner. Specific locations where the flanges will be placed will be determined on the site by the Engineer and the architect according to quality of construction. However, in washrooms, baths, concierge, etc. all pipes will have collars.
- .2 Inside diameter must be the same size as outside of the pipe including isolation. Outside diameter must be larger than that of the opening or the sleeve.
- .3 If the sleeve exceeds the finished floor, the facing collars or plates must surround the extension of the sleeve.
- .4 Fasten to pipe or finished surface, but not to insulation.

3.11 FLUSHING AND BLOWING OF SYSTEMS

- .1 Prior start-up of a piping system, clean the piping system in accordance with the relevant sections of Divisions 21, 22, 23 and 26.
- .2 Blow all conduits with compressed air before pulling cables and wires.

- .3 Preparatory to acceptance, clean and restore equipment and replace system filters.

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPING

- .1 Notify Engineer at least 48 hours prior to pressure testing.
- .2 Test piping in accordance with relevant sections of divisions 21, 22 and 23.
- .3 Insulate or conceal works only after having approved and certified tests by the Engineer.
- .4 Provide a report of tests performed with statement of procedure used, times and other relevant deadlines. Identify witnesses of the tests.

3.13 EXISTING SYSTEMS

- .1 Connect new piping to existing systems when approved by Engineer and / or Owner.
- .2 Request written approval at least ten (10) days prior to commencing work.
- .3 Assume full responsibility for any damage that may be caused by this work to the existing facility.
- .4 Clean up site daily
- .5 Coordinate with the owner any work having an effect on existing systems that may affect the operation of systems in use in the rest of the building.

3.14 EXCAVATION AND BACKFILLING RELATED TO MECHANICAL AND ELECTRICAL WORKS

- .1 All excavation and backfilling required for the installation of piping and underground piping, equipment bases, pits, etc., will be provided and executed, under the supervision and guidance of the trade concerned provided and performed by the general Contractor.
- .2 Trenches will be excavated at location shown on drawings. Follow the route requested and if there is a major obstacle, notify the Engineer who will make required decisions.
- .3 Trench shall be of sufficient depth to meet the profile required for pipes or conduits and the minimum width required for their installation and to ensure the safety of employees.
- .4 Excavation for piping will be prepared so that no surface is directly on the rock or any other hard surface. The bottom of the trench will consist of a bed of sand about 150 mm thick, well compacted up to 95 % of the volumetric mass of the modified Proctor. Precautions will be taken to ensure even support over the entire length of the pipe.
- .5 Backfilling will not commence until the facility is inspected and approved, testing is completed and Engineer's approval is obtained.
- .6 Backfilling of the trench directly onto the piping will be done with fine sand without stone or pebble so as to cover all pipes or pipes with a thickness of at least 100 mm above the pipe. The rest of the filling will be done according to the prescribed guidelines of section 31. For piping or conduit buried in a mass of concrete, backfilling will be conducted according to the guidelines prescribed in section 31.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

- .1 Section includes:
 - .1 Identification of systems and mechanical equipments.
 - .2 For identification of electrical appliances and equipment, refer to Section 26 05 01.

1.2 REFERENCES STANDARDS

- .1 American Society of Mechanical Engineer.
 - .1 ASME A13.1 - 2007 Scheme for the Identification of Piping Systems
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 13, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems.
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-24.3 Identification of Piping Systems.
- .4 Canadian Standards Association CAN/CSA B149.1
 - .1 Code d'installation du gaz naturel et du propane (2010).
- .5 Refer to the most recent versions in effect.

1.3 ACTION AND INFORMATION SUBMITTALS

- .1 Submit required technical data sheets as well as specifications and manufacturer's literature regarding products in conformity with the "Action and information submittals" clause in Section 21 05 01. These sheets must indicate the product characteristics, the performance criteria and the limitations.

1.4 QUALITY ASSURANCE

- .1 Quality assurance: submit the required documents in conformity with the "Action and information submittals" clause in Section 21 05 01.

Part 2 Products

2.1 MANUFACTURER'S NAME PLATES

- .1 Metallic or laminated plastic name plates will be mechanically fastened by the manufacturer to material pieces.
- .2 Inscriptions (letters and numbers) must be in relief or engraved.

- .3 The following information, according to each case, must be indicated on the name plates.
 - .1 Device: Manufacturer's name, model, dimensions, serial number, power, flow.

2.2 SYSTEMS IDENTIFICATION PLATES

- .1 Colors Dangerous materials: red lettering on a white background.
 - .1 Other materials: black lettering on a white background (except for different indication in standard).
- .2 Materials and other fabrication characteristics
 - .1 3 mm thick plastic laminated plates, mat black, with square corners as well as machine-engraved lettering, precisely aligned and engraved to the core.
- .3 Dimensions of the labels

Diameter of piping	Minimum dimension of the text	
	Minimum length	Minimum height
¾ in (19 mm) to 1-¼ in (32 mm)	8 in (200 mm)	½ in (13 mm)
1-½ in (38 mm) to 2 in (50 mm)	8 in (200 mm)	¾ in (19 mm)
2-½ in (64 mm) to 6 in (150 mm)	12 in (300 mm)	1-¼ in (32 mm)
8 in (200 mm) to 10 in (250 mm)	24 in (800 mm)	2-½ in (64 mm)
10 in (250 mm) and more	32 in (800 mm)	3-½ in (89 mm)

2.3 IDENTIFICATION ACCORDING TO EXISTING SYSTEM

- .1 Identify the works added or improved according to existing identification system.
- .2 Where the existing identification system does not provide for the identification of new installed works, they shall be identified in accordance with the requirements of this section.
- .3 Prior undertaking work obtain written approval of identification system by the owner.
 - .1 Identify, as specified by the owner, all equipment requiring maintenance (pump, motor, trap, etc.). Location of all equipment to be identified will be coordinated at the site with the owner, as the owner will provide identification plates and update his database of his preventive maintenance system.

2.4 PIPING SYSTEMS GOVERNED BY STANDARDS

- .1 Identification.
- .2 Natural gas and propane: according to CAN / CSA B149.1, latest edition.

2.5 PIPING IDENTIFICATION

- .1 Fluid flowing in pipes must be identified by background color markings, by pictograms (as needed) and/or by key reference. The flow direction must be indicated by arrows. Unless otherwise indicated, piping must be identified in accordance with the CAN/CGSB 24.3 standard.

- .2 Pictograms
 - .1 As needed, pictograms must conform to the *Workplace Hazardous Materials Information System* (WHMIS).
- .3 Key reference
 - .1 Upper case letters with height and color conforming to the CAN/CGSB 24.3 standard.
- .4 Flow-direction arrows
 - .1 50 mm wrapping strip with an arrow showing flow direction;
 - .2 Double-headed arrows when flow is reversible.
- .5 Background color markings dimensions
 - .1 Height: sufficient to cover the circumference of the pipe/insulation.
 - .2 Length: sufficient for the on lay of the pictogram, the key reference and arrows.
- .6 Fabrication materials of background color markings, lettering (key reference) and arrows
 - .1 Tubes and pipe of 20 mm diameter and less: self-adhesive plastic stickers, water and heat resistant.
 - .2 Other pipes: self-adhesive vinyl stickers, with a protective coating and underside coated with water-resistant, contact adhesive, designed to resist a relative humidity of 100% at a constant temperature of 150°C and an intermittent temperature of 200°C.
- .7 Background colors and key references
 - .1 When the background colors and key references are not specified, follow the Engineer's directives.
 - .2 Colors for key reference and arrows: follow the table below.

Background color	Key reference, arrows
Yellow	BLACK
Green	WHITE
Red	WHITE

- .3 Background and key reference marking colors for piping

Contents/ Fluid moved	Color		Key reference text
	Background	Text	
Domestic cold water	Green	White	EAU FROIDE DOM.
Domestic hot water	Yellow	Black	EAU CHAUDE DOM.
Domestic hot water recirculation	Yellow	Black	RECIRC. EAU CHAUDE DOM.

2.6 INSCRIPTIONS UNILINGUAL/BILINGUAL

- .1 Inscriptions for identification of systems and elements must be prepared in French.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Conformity: conform to the manufacturer's written requirements, recommendations and specifications, including any available technical bulletins, instructions relative to maintenance, storage and installation of products, and to indications on technical sheets.

3.2 TIMING

- .1 Do not begin systems and equipments identification before painting is completed.

3.3 INSTALLATION

- .1 Unless otherwise indicated, identify systems and equipments in conformity with the CAN/CGSB-24.3 standard.
- .2 Supply ULC and CSA listing plates required by each respective organization.

3.4 IDENTIFICATION PLATES

- .1 Location
- .1 Plates must clearly identify the equipments and/or the piping systems and they must be installed in locations where they will be in full view and easily identifiable from the work floor.
- .2 Protection
- .1 Do not apply paint, insulation or any coating on identification plates

END OF SECTION

Part 1 GENERAL

1.1 REQUIREMENTS

- .1 General requirements
 - .1 Refer to Section 20 05 01 " General Requirements for Mechanical and Electrical Specializations"
- .2 Sections distribution
 - .1 For distribution of sections to responsible specialties, refer to the table of contents for mechanical and electrical works.

1.2 REFERENCE STANDARDS

- .1 Refer to Section 20 05 01, paragraph " Reference standards ".
- .2 Various components and fire protection systems of this project shall meet the requirements prescribed in latest edition of different NFPA standards especially NFPA-10, 13, 14, 20, 24, 291.

1.3 SEISMIC MEASURES

- .1 Refer to Section 20 05 01.

1.4 COORDINATION BETWEEN SPECIALTIES

- .1 Refer to Section 20 May 01 " Coordination between specialties ".
- .2 Participate actively in the above and provide any required information and follow arrangements between specialties.
- .3 Be responsible for any travel required as a result of a lack of the above.

1.5 SCOPE OF WORK

- .1 Work in the "Fire Protection" specialty includes, without being limited to, the following items:
 - .1 Supplies and installation of new automatic wet sprinkler systems for complete protection of areas indicated on the drawings. The whole as shown on the drawings and prescribed in section 21 13 13 of the specifications.
 - .2 Arrangement of automatic sprinkler heads shown on the drawings is for information only, these are not manufacturing plans. The final layout will have to be coordinated with the other trades and validated by the Engineer.
 - .3 Piping will be installed mostly as high as possible or as directed on plans or in locations determined during coordination meetings between different specialties.
 - .4 Installation of piping and sprinklers must in no case prevent the maintenance of electrical or mechanical equipment.

1.6 ACTION AND INFORMATION SUBMITTALS

- .1 Submit required documents and samples conforming to Section 20 05 01.

1.7 FIRE PROTECTION SYSTEMS SPECIAL FEATURES AND COMMISSIONING

- .1 Install fire protection systems in accordance with approved erection drawings and in accordance with NFPA Standards 13 and 14 as well as the standards of the province of Quebec.

1.8 SLEEVES

- .1 Refer to Section 20 05 01 " General Requirements for Mechanical and Electrical specialties".

1.9 INSPECTION

- .1 It is forbidden to embed, paint or conceal pipes, accessories, or work before they have been inspected or approved by the Engineer.

1.10 WORK IN EXISTING BUILDING OR SYSTEM

- .1 Refer to Section 20 05 01.
- .2 When an existing building or part of a building is used during the work period, the protection system must be kept active at all times for the sections used. To do this, any temporary work required will have to be included and executed. In order to carry out this work, interruptions of short durations during a shift will be tolerated provided that the system is operational at all other times. The foregoing shall be provided and included by the Contractor.

1.11 PROTECTION AND CLENLINESS REGARDING FIRE PROTECTION WORKS

- .1 Using appropriate methods, prevent dust, dirt and other foreign materials from getting into openings in equipments, materials and systems.
- .2 The fire protection speciality must take all necessary measures so that the inside of all equipment, components and piping be free from debris after their installation.
- .3 During installation, the seals at each end of the conduits should be left in place by the Contractor until the next joint is made.
- .4 The Contractor will be responsible for taking all necessary steps in order to protect the piping systems from all substances likely to contaminate the interior or the accessories.
- .5 According to the Engineer's judgement, any activity susceptible of generating dust and/or dirt and/or contaminants, which could harm the project environment, must be done outside the perimeter of the building.

1.12 TESTING

- .1 Requirements listed below are to be added to those of listed tests
 - .1 Provide a notice of twenty-four (24) hours before the testing date.
 - .2 Do not conceal work before it has been tested and approved. Follow the work calendar and make the required preparations for the tests.
 - .3 Perform testing in presence of the Engineer.
 - .4 Cover all costs, including those of new testing and those of repair.
 - .5 Piping service pressure:
 - .1 Perform a hydrostatic test of all fire protection systems at a pressure equal to one time (1) the operating pressure of the systems or at a minimum pressure of 1300 kPa.
 - .2 Unless otherwise noted, pressurize the system and make sure there are no leaks for a period of two (2) hours.
- .2 Hydrostatic tests for aboveground piping
 - .1 All above-ground piping of the whole installation will be subjected to a hydrostatic pressure test of 350 kPa above the maximum pressure to which the system may be subjected, but not less than 1400 kPa. The test shall last at least two (2) hours and no pressure drop or leakage shall be observed. Any leaks must be repaired and the test repeated until a perfect seal is achieved.
 - .2 In addition to 1400 kPa hydrostatic tests for two (2) hours, an airtightness test shall be performed on the piping system at a pressure of 275 kPa for a period of one (1) hour. Any air leak allowing a loss of pressure will be corrected.

1.13 FINAL ACCEPTANCE AND TESTS PRIOR TO ACCEPTANCE

- .1 Inspection and acceptance testing
 - .1 After installation and testing prior to acceptance completed , an inspection report (like those for annual inspections of automatic sprinkler systems) and an inspection certificate will be provided to the Engineer at end of the project. Results of all tests duly recorded in a booklet will be attached to the inspection report, including the operating pressures of all equipment.
- .2 Contractor's Materials and Testing Certificate
 - .1 Perform all pre-tests specified below in accordance with NFPA Standards 13, 14 and 24. Contractor's Material and Test Certificate signed by the Contractor will be issued in accordance with NFPA Standard No. 13, Section 1-12.

END OF SECTION

Part 1 GENERAL

1.1 TERMS AND DEFINITIONS

- .1 Summary
 - .1 Section includes
 - .1 Special installation requirements for piping and accessories.

Part 2 PRODUITS PRODUCTS

NOT APPLICABLE

Part 3 EXECUTION

3.1 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer
- .2 Provide space for disassembly, removal of equipment and components without interrupting operation of other systems, equipment or components. The space must be dimensioned in accordance with the drawings or the manufacturer's recommendations, whichever is the higher

3.3 SUSPENSION HANGERS

- .1 Conform to NFPA 13 standard, covering automatic sprinkler systems, NFPA 14, covering fire piping systems and to Division 21.
- .2 Supports, braces and restraints listed by ULC and FM for utilisation in a fire protection system.
- .3 Refer to the latest versions in effect.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Summary
 - .1 Section contents
 - .1 Materials and installation methods associated with water based, automatic fire extinguishing systems, serving heated areas.

1.2 REFERENCES STANDARDS

- .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)
 - .1 ANSI/NFPA 13, Installation of Sprinkler Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATION SUBMITTALS

- .1 Submit samples for the following elements:
 - .1 Indicative plates.

Part 2 Products

2.1 PIPING ABOVE GROUND

- .1 Pipes:
 - .1 Automatic sprinkler and fire piping will be continuous welded black pipe or Electric Resistance Weld, conforming to the A53 or A120, ASTM standard.
- .2 Piping of DN 2 and under shall be schedule 40 and shall be joined by means of screwed connections or by means of mechanical coupling sleeves for grooved pipes.
- .3 Fittings:
 - .1 Threaded fittings on above-ground piping will be standard weight cast iron, 860 kPa, according to ASTM A-26 and ANSI B16.4 standards, or standard weight malleable cast iron, 1000kPa, according to ASTM A-47 and ANSI B-16.3 standards.
 - .2 Flanges will be threaded type, standard weight cast iron, 860 kPa, meeting ASA B16.1, ASA B2.1 and ASTM A126 standards.
 - .3 The mechanical coupling fittings will be prefabricated type, with malleable iron grooves or shoulders, according to ASTM A47 or in ductile cast iron, according to ASTM A536.
 - .4 Mechanical fittings on ductile cast iron pipe for potable water and steel fire piping :

- .5 Transition mechanical fittings for joining AWWA ductile cast iron pipe with steel pipe (valves, elbows, check valves) for fire protection. The segments (body) are assembled at an angle to verify the alignment of the grooves of different types of pipe. The segments (body) are of ductile cast iron conforming to ASTM A- 536, Grade 65-45-12. Molded seal for Style 307 fittings, FlushSeal grade M.

Acceptable product: Victaulic Style 307.

- .6 Mechanical fittings on ductile cast iron pipe for potable water :

Mechanical fittings designed for AWWA standard ductile iron pipe. To make the grooves, the piping must have wall thicknesses greater than ANSI / AWWAC151 / A21.51 class 53. Mechanical fittings must be equivalent to flanged joints. The segments (body) are ductile iron in accordance with ASTM A-536, Grade 65-45-12. FlushSeal 31 grade M triple seal.

Acceptable Product : Victaulic Style 31

- .4 Piping slope:

- .1 All sprinkler piping and fire mains will be installed so that it may be completely drained. If possible, arrange the piping so this draining is done by the main drain valve.

2.2 AUTOMATIC SPRINKLERS

- .1 Sprinklers shall be quick response type ensuring a uniform and complete spraying. Usage of old models is prohibited.
- .2 Fusion temperatures shall be appropriate for the location or the application conforming to requirements of the NFPA 13 standard and to this specification. Fusion temperatures and nominal orifices of automatic sprinkler heads must be chosen according to the installation location and of hydraulic calculations. When a temperature and an orifice size are given, it is only given as general information. Final installation must consider the site requirements and take into account heating equipments, piping, skylights, lighting fixtures, etc. and other heat sources. Nominal temperatures and orifices must conform to requirements of NFPA 13.
- .3 Sprinklers shall have colored frame arms in accordance with standard color code for identification of temperature category.
- .4 Unless otherwise specified on drawings, sprinklers shall have a DN $\frac{1}{2}$ orifice with male DN $\frac{1}{2}$ threaded fittings. Those in the storage area will have a DN $\frac{17}{32}$ orifice with a threaded fitting of DN $\frac{3}{4}$.
- .5 All sprinklers shall be listed by ULC and approved by FM.
- .6 Sprinklers shall have the characteristics indicated in tables shown on the plans.

Part 3 Execution

3.1 INSTALLATION

3.2 PIPING INSTALLATION

- .1 Install piping level and square, so that it rests uniformly on supports and hangers. Do not fasten hangers to a plaster ceiling.
- .2 Make sure that the interior and the extremities of new and existing piping is free from water and foreign materials.
- .3 During installation, and at the end of each work period, close open ends of piping, using plugs or another appropriate method, to prevent introduction of foreign material.
- .4 Inspect piping before its installation.

3.3 MANUFACTURER'S INSTRUCTIONS

- .1 Conformity: conform to the Manufacturer's requirements, recommendations and to his written specifications, including any available technical bulletins, to handling, storage, and product installation instructions, and to technical data sheets.

3.4 SPECIFIC REQUIREMENTS

- .1 Notify the owner in advance of the sequence of the areas affected by work, as the work progresses.

3.5 ELECTRICAL CONNECTIONS

3.6 QUALITY CONTROL DURING EXECUTION

- .1 On-site tests/inspections:
 - .1 Perform tests in the presence of the Engineer, to verify the conformity to the stated requirements.
 - .2 Perform tests and required inspections and approve piping before it is concealed.
 - .3 Preliminary tests:
 - .1 Proceed with a hydrostatic test of each system at a pressure of 1400 kPa, for a period of two (2) hours, during which time there must be no leaks or pressure
 - .2 Rinse the piping with potable water according to NFPA 13.
 - .3 Perform the required tests and approve the piping installed in ceiling spaces, before the ceiling installation.
 - .4 Final inspections and tests:
 - .1 Do not request final tests and inspections before the completion of preliminary tests and any required corrections.

- .2 Submit the request for final inspections at least fifteen (15) days before the desired inspection date.
- .5 Repeat the required tests according to the directions.
 - .1 Correct anomalies and perform additional tests until the systems conform to the contract requirements.
- .6 Supply the apparatus, instruments, connection equipments and the manpower required for the testing.

3.7 INSPECTION

- .1 It is forbidden to recess, paint or conceal pipes, accessories or work before its inspection and approval by the Engineer.

3.8 ADJUSTMENT

- .1 Do final adjustment of the equipment so it will operate to the satisfaction of the Engineer and competent authorities.

3.9 FINAL APPROVAL AND TESTS PRIOR TO ACCEPTANCE

- .1 Inspection and acceptance tests:
 - .1 Once installation and pre-acceptance tests have been completed, systems shall be subject to inspection and system operation tests will be done. An Inspection report (like those of annual inspections of automatic sprinklers), and an inspection certification will be supplied to the Engineer at the end of the project. All the test results, assembled in a booklet, will be attached to the inspection report, including operation pressures of all equipment.
- .2 Certificate of materials and tests by the Contractor:
 - .1 Preparatory to acceptance, perform all pre-requisite tests, specified hereafter, according to the standards of NFPA 13 and 14. A certificate of materials and tests by the Contractor will be prepared and signed by the Contractor and the Engineer. This certificate will be presented according to Chapter 24 of the NFPA 13 standard.
- .3 Hydrostatic tests of above-ground piping:
 - .1 All above-ground piping of the complete installation will be subjected to a hydrostatic pressure test at 350 kPa above the maximum pressure to which the system may be subjected, but not less than 1400 kPa. The test must last at least two (2) hours and no pressure drop or leak may be observed. Any leaks will be repaired and the test repeated until a complete seal is obtained.
 - .2 In addition to the hydrostatic tests (200 lbs for 2 hours), an air seal test will be done on the piping system at a pressure of 275 kPa (40 psi) for one hour. Any air leak allowing a pressure loss will be corrected.
- .4 Air pressure test:
 - .1 Perform a test demonstrating that normal air pressure can be restored to the system within 30 minutes

3.10 CLEANING

- .1 Perform cleaning work sin accordance with Section 20 05 01
- .2 Once installation and performance control testing has been completed, remove surplus materials, waste, tools and equipment from the construction site.

END OF SECTION

Part 1 General

1.1 REQUIREMENTS

- .1 General requirements
 - .1 Refer to Section 20 05 01.
- .2 Distribution of sections
 - .1 For distribution of sections to responsible specialties, refer to the table of contents of the mechanical and electrical works.
 - .2 Seismic measurements, refer to Section 20 05 01.

1.2 REFERENCE STANDARDS

- .1 Refer to Section 20 05 01, " Reference standards " paragraph.
- .2 All piping, fittings and equipment in contact with potable water must comply with NSF standards applicable particularly NSF 61.

1.3 SEISMIC MEASURES

- .1 Refer to Section 20 05 01.

1.4 COORDINATION BETWEEN SPECIALTIES

- .1 Refer to Section 20 05 01.
- .2 Participate actively in the above and provide any required information and follow arrangements between specialties.
- .3 Be responsible for all travel required as a result of a breach of the above.

1.5 PORTÉE DES TRAVAUX SCOPE OF WORK

- .1 "Plumbing" specialty work include supply and installation of all equipment conduits and accessories shown on the drawings of this specialty and described in Division 22 of the specifications.
 - .1 Plumbing " specialty works also includes the following :
 - .1 Perform the designation of equipment for plumbing systems and plumbing equipments as prescribed in Section 20 05 53.
 - .2 All seismic fastening systems for piping and plumbing equipments as prescribed in Section 20 05 01.
 - .3 All demolition and removal of designated equipment and pipes to be removed.

1.6 ACTION AND INFORMATION SUBMITTALS

- .1 Submit required documents and samples in accordance with Section 20 05 01.

1.7 PLUMBING WORK PECULIARITIES AND SET-UP

- .1 Ensures that maintenance and disassembly can be done with the least possible movement of pipe and conduit junctions, use of unions and flanges, and without any building structural elements or any other installation forming an obstacle.
- .2 Connect drain lines to drains.

1.8 SLEEVES

- .1 Refer to Section 20 05 01.

1.9 EXCAVATION AND BACKFILLING RELATED TO PLUMBING WORKS

- .1 Refer to Section 20 05 01.

1.10 ANCHORING AND EXPANSION RELATED TO PLUMBING WORK

- .1 Piping must be installed in such a way so it is free to expand or contract without excess effort or wear on the exterior of the pipe or on the insulation, and so no effort is transferred to the equipment or to the fittings.
- .2 Anchor the piping in the locations indicated and/or required, with the use of appropriate anchors, solidly fastened to the piping and to the building structure, so as to maintain the piping fixed at that point. The building structure must not be damaged by the presence of anchors.
- .3 For copper piping, steel anchors will be isolated by means of neoprene sleeves.

1.11 PRESSURE TESTING OF EQUIPMENT AND PIPING

- .1 Notify Engineer at least 48 hours prior to pressure testing.
- .2 Test piping in accordance with relevant sections of divisions 22.
- .3 Pressurize the system and ensure that no leakage occurs for a period of at least two (2) hours, unless a longer period is prescribed in the relevant sections of the Division 22.
- .4 Prior to testing, isolate equipment and components from the system that are not designed to withstand the pressure or intended test agent.
- .5 If applicable, pay for repair or replacement of defective items, retest and reconditioning of the system. The Engineer will determine if it is necessary to repair or replace the items deemed defective.
- .6 Perform tests in accordance with the following :

1.12 PLUMBING WORK TESTS

- .1 Hydrostatically test the water distribution systems at a minimum pressure of 860 kPa. For locations where the operating system pressure exceeds 575 kPa, test at 1.5 times the pressure of the operating regime.
- .2 Unless otherwise indicated, pressurize the system and ensure that no leakage occurs for a period of two (2) hours.
- .3 Test drainage waste, drain and vent piping for sanitary systems as follows :
 - .1 Gravity system: Make the test with a water column of 3 m above the average ground level.

1.13 WORKS IN BUILDING OR EXISTING SYSTEM

- .1 Refer to Section 20 05 01.
- .2 When an existing building or part of a building is used during the work period, plumbing systems shall always be kept active for the sections used. To do this, all temporary work required will have to be included and executed. In order to carry out this work, interruptions of short durations during a shift will be tolerated provided that the system is operational at all other times. The foregoing shall be provided and included by the Contractor.

1.14 PROTECTION AND CLEANLINESS RELATING TO PLUMBING WORK

- .1 In using appropriate elements, prevent dust, dirt and other foreign matter from entering the openings of the equipment, materials and systems.
- .2 "Plumbing" specialty must take all necessary measures to ensure that the interior of all equipment, components and piping are free of debris after installation.
- .3 During installation, the sealing at each end of the conduits will be left in place by the Contractor until the next joint is made.
- .4 The Contractor will be responsible for taking all necessary measures to protect all piping systems against all substances that may soil the interior and accessories.
- .5 Any activity that may, in the opinion of the Engineer, generate dust and / or dirt and / or contaminants that may affect the quality of the project environment shall be performed outside the perimeter of the project. the building.

END OF SECTION

Part 1 General

1.1 TERMS DEFINITION

- .1 Summary
 - .1 Section contents
 - .1 Special installation for piping and accessories.

1.2 PRODUITS PRODUCTS

NOT APPLICABLE

Part 2 Execution

2.1 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement or use flexible joints.

2.2 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide sufficient working space to disassemble and remove equipment or parts of equipment, if necessary, without the need to interrupt the operation of other devices or systems elements. The space allowed must be in accordance with the drawings or the manufacturer's recommendations, whichever is the higher.

2.3 VALVES

- .1 Install in accessible locations
- .2 Remove interior parts before soldering.
- .3 Install with the stems above horizontal position unless indicated.
- .4 Valves must be accessible for maintenance without removing adjacent piping.
- .5 Use gate, ball, or butterfly valves at branch take-offs for isolating purposes, except where specified.

2.4 DRAINS

- .1 Install piping with grade in direction of flow except as indicated.

- .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

2.5 DIELECTRIC COUPLINGS

- .1 General: must be compatible with the system and to suit pressure rating of system.
- .2 Locations: use where dissimilar metals are joined.
- .3 NPS 2 and under: use isolating unions or bronze valves.
- .4 Over NPS 2: use isolating flanges or bronze valves.

2.6 PIPEWORK INSTALLATION

- .1 Screwed fittings will be jointed with Teflon tape.
- .2 Protect openings against entry of foreign material.
- .3 Install piping so as to isolate equipment and allow removal without interrupting operation of other equipment or systems
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main.
 - .1 Hole saw (or drill) and ream the main to maintain full inside diameter of the branch line prior to welding the saddle.
- .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .7 Install concealed pipework to minimize furring space, maximize headroom and to conserve space.
- .8 Slope piping, except where indicated, in the direction of flow for positive drainage and venting.
- .9 Install piping, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Group piping wherever possible and as indicated on drawings.
- .11 Ream pipes and remove scale and other foreign material before assembly.
- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated.
- .14 Rinsing the plumbing system
- .15 Before starting a piping system, clean the piping system in accordance with the relevant sections of Division 22.

- .16 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

2.7 EXISTING SYSTEMS

- .1 Connect new piping to existing systems when approved by the Engineer.
- .2 Request written approval at least 10 days prior to commencing work.
- .3 Assume full responsibility for any damage that may be caused by this work to the existing facility.
- .4 Clean up site daily.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes :
 - .1 Prefabricated supports and suspension or manufactured for piping and plumbing fixtures.
 - .2 Anchoring and fastening of piping.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1, Power Piping.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP 58], Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 ANSI/MSS SP69, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .5 Refer to the most recent versions in effect.

1.3 ACTION AND INFORMATION SUBMITTALS

- .1 Submit manufacturer's data sheets, specifications, and product literature in accordance with the " Action and information submittals " clause of Section 20 05 01

1.4 SYSTEMS DESCRIPTION

- .1 Design Requirements
 - .1 Pipe supports must be carried out according to manufacturer's recommendations, using parts, components and common assemblies.
 - .2 ASME B31.1 where maximum loads shall be determined from the allowed stress indications contained in ASME B31.1 or MSS SP 58.
 - .3 Supports, guides and anchors shall not convey abnormal heat to structures.

- .4 Supports and suspensions must be designed to support piping and mechanical equipments under operating conditions, to allow contraction and expansion movements of supported elements and to prevent excessive stresses on pipes and equipments to which they are attached. are connected.
- .5 Supports and suspensions shall be adjustable vertically after installation and during commissioning of facilities. The extent of adjustment must be in accordance with MSS SP 58.

Part 2 Products

2.1 GENERAL

- .1 Supports, suspensions and bracing components shall be manufactured in accordance with ANSI B31.1 and MSS-SP 58.

2.2 ANCHORING ELEMENTS

- .1 Concrete works
 - .1 Cast-in, galvanized steel corner support, according to standard MSS-SP69, for piping diameters from DN ¾ to DN 8.
 - .1 Reference product: Anvil, fig. 281 or equivalent.
 - .2 Mechanical anchor with wedge or hot galvanized expansion shields such as Hilti anchors or equivalent.
- .2 Steel beams (lower flange)
 - .1 Cold piping DN 2 diameter and less: malleable iron C stirrup, meeting the standard MSS-SP58, type 19
 - .1 Reference product: Anvil, fig. 94 or equivalent.
- .3 Steel beams (upper flange)
 - .1 Cold piping DN 2 diameter and less: malleable iron C stirrup, for top of beam, meeting the standard MSS-SP69, type 19.
 - .1 Reference product: Anvil, fig. 94 or equivalent.
- .4 Steel joist
 - .1 Cold piping DN 2 diameter and less: steel plate with two (2) locknuts.
 - .1 Reference product: Anvil, fig. 60 or equivalent.
- .5 Steel shapes or angles (lower leg)
 - .1 Cold piping DN 2 diameter and less: malleable iron C stirrup, meeting the standard MSS-SP58, type 23
 - .1 Reference product: Anvil, fig. 86 or equivalent.
- .6 Steel shapes or angles (upper leg)
 - .1 Cold piping DN 2 diameter and less: malleable iron C stirrup (for beam top), meeting the standard MSS-SP58, type 19

- .1 Reference product: Anvil, fig. 61 or equivalent.

2.3 MEDIAN ELEMENTS (SUSPENSION RODS)

- .1 Carbon steel threaded rod with black finish.
 - .1 Reference product: Anvil, fig. 146, or equivalent.

2.4 SUPPORT ELEMENTS

- .1 Cold steel or cast iron piping, hot steel piping, with horizontal movement less than 25 mm; hot steel piping suspended on rods longer than 300 mm: adjustable stirrup, meeting the standard MSS-SP58, type 1
 - .1 Reference product: Anvil, fig. 260, or equivalent.
- .2 Cold and hot copper piping, with horizontal movement less than 25 mm, hot copper pipe suspended on rods longer than 300 mm: adjustable stirrup, meeting the standard MSS-SP58, type 1, with copper finish.
 - .1 Reference product: Anvil, fig. CT-65 or equivalent.

2.5 SUPPORT ELEMENTS

- .1 Hot steel and copper suspended piping with horizontal movement greater than 25 mm, hot steel pipe suspended on rods longer than 300 mm: roller stirrup conforming to the standard MSS-SP58, type 43.
 - .1 Reference product: Anvil, fig. 181 or equivalent.
- .2 Hot steel and copper piping suspended from below: pedestal roller meeting the standard MSS-SP58, type 45.
 - .1 Reference product: Anvil, fig. 181 or 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 datasheet.

3.2 INSTALLATION

- .1 Install supports and suspensions as follows
 - .1 Per instructions and manufacturer's recommendations.

3.3 DISTANCE BETWEEN SUPPORTS AND SUSPENSIONS

- .1 Piping for plumbing systems: according to Quebec Construction Code.
- .2 Copper piping with a nominal diameter of DN ½ and less: one (1) support/ suspension every 1.5 m.

- .3 Piping with rolled grooves at each end, with flexible joints: support according to the table below, but with at least one (1) support/ suspension at each joint.
- .4 Install one (1) support/ suspension within 300 mm of each elbow.

Nominal pipe diameter (DN)	Maximum spacing for steel pipe	Maximum spacing for copper pipe	Maximum spacing for PVC pipe
Jusqu'à 1¼	2.1 m	1.8 m	1.2 m
1½	2.7 m	2.4 m	1.2 m
2	3.0 m	2.7 m	1.5 m
2½	3.6 m	3.0 m	1.7 m
3	3.6 m	3.0 m	1.9 m
4	4.2 m	3.6 m	2.2 m
5	4.8 m	---	2.7 m
6	5.1 m	---	2.8 m
8	5.7 m	---	3.0 m
10	6.6 m	---	3.5 m
12	6.9 m	---	3.8 m

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 This section covers operations, methods and requirements for testing, adjusting and balancing (TAB) of plumbing systems
- .2 TAB operations are test, adjustment and balancing operations to ensure that the various systems operate in accordance with the requirements set out in the contract documents. TAB operations also include all other work described in this section

1.2 QUALIFICATION OF TAB OPERATIONS PERSONNEL

- .1 Within 90 days of contract award, submit to Engineer the list of personnel who will perform testing, adjustment and balancing operations.
- .2 Test, adjustment and balancing operations must be performed in accordance with the requirements of the standard regulating the company's qualification and the personnel responsible for them.
 - .1 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems (latest edition in force).
- .3 TAB operations must be performed according to the recommendations and practices suggested in the adopted standard
- .4 In order to meet contractual requirements, comply with the requirements of the standard adopted for TAB operations and use the checklists and forms proposed therein
- .5 Comply with the requirements of the selected standard for TAB operations, including the company's qualification and the personnel responsible for the work as well as calibration measuring instruments used.
- .6 Comply with manufacturer's recommendations for instruments calibration when they are more stringent than the recommendations in the TAB operations standard.
- .7 Requirements of quality assurance standard, including performance guarantees, form an integral part of this contract.
 - .1 For systems or components not covered by the adopted standard for TAB operations, use methods developed by the work specialist in charge.
 - .2 Where new methods and requirements are relevant to the Contractual Requirements and have been published or adopted by the Responsible Authority (NEBB) of the selected standard for testing, adjustment and balancing operations, the defined requirements and the recommendations are mandatory.

1.3 PURPOSE OF TAB OPERATIONS

- .1 Test various plumbing systems to ensure they are operating safely and appropriately, determine the actual operating point and assess the qualitative and quantitative performance of equipments, pumps and flow control devices. systems, and this at nominal load.

- .2 Set plumbing systems so they meet prescribed performance requirements under nominal load, normal emergency operations.

1.4 EXCEPTIONS

- .1 Testing, adjustment and balancing of equipment and systems governed by particular standards shall be performed to the satisfaction of the appropriate authorities.

1.5 COORDINATION OF WORK

- .1 Allow time, within the construction schedule, for system testing, adjustment and balancing operations (including repairs and retests), which must be completed preparatory to acceptance.
- .2 Test, adjust and balance each separate system.

1.6 CONTRACTUAL TERMS REVIEW RELATING TO THE TAB OPERATIONS

- .1 Review contract documents prior to commencement of construction and confirm in writing to the Engineer that testing, adjustment and balancing of equipment, systems and other design considerations are required along with appropriate installation ensuring the success of these operations.
- .2 Review the standards and other prescribed reference documents and inform the Engineer in writing as to the methods proposed in the contract documents, which differ from those described in the standards or reference documents.
- .3 During construction works, coordinate the location and installation or layout of devices, equipments, accessories, openings and fittings necessary for the performance of TAB operations.

1.7 DEVICES AND SYSTEMS START-UP

- .1 Unless otherwise indicated, follow the start-up procedure recommended by the manufacturer of the devices.
- .2 Follow any special start-up procedures prescribed elsewhere in Division 22.

1.8 OPERATION OF DEVICES AND SYSTEMS DURING TAB OPERATIONS

- .1 Operate plumbing systems for required time to perform TAB operations and for required time by the Engineer to verify TAB reports.

1.9 START OF TAB OPERATIONS

- .1 Notify Engineer seven (7) days prior to start testing, adjustment and balancing.
- .2 Undertake TAB operations only when the building largely serviceable and that is either when:
 - .1 Pressure, sealing and other tests prescribed in other sections of Division 22 are complete;
 - .2 The equipment required to perform the TAB operations is installed and in good working order;

- .3 All systems of hot and cold domestic water supply including all components (without exception). Also, once all fixtures are installed, turned on and tested and that the proper operation of systems has been demonstrated, which includes:
 - .1 Thermal protection and electrical overload material is in place;
 - .2 Plumbing systems (hot and cold domestic water)
 - .1 Rinsed and pressure pipes at rated conditions.
 - .2 Isolation valves in place and open.

1.10 SETTINGS

- .1 After the TAB operations have been completed to the satisfaction of the Engineer, lock the actuators in the operating position and verify that the sensors are set to the required set points.
- .2 Mark adjustment positions permanently; these must not be erased or covered in any way.

1.11 END OF TAB OPERATIONS

- .1 System test, adjustment and balancing operations will not be considered complete until the final report has been approved by the Engineer.

1.12 PLUMBING SYSTEMS

- .1 For the purposes of this section, plumbing systems include water systems operating with the following liquids :
 - .1 Domestic hot water,
 - .2 Drinking cold water
 - .3 Recirculated hot water.
- .2 TAB operations must be performed in accordance with the most stringent requirements set out in this section or in relevant ASHRAE standards and reference documents.
- .3 Test, adjust and balance systems, equipment and flow control devices prescribed in Division 22.
- .4 The persons responsible for performing TAB operations must be authorized to provide the prescribed services.
- .5 System testing, adjustments and balancing operations shall be performed with guidance of a supervisor who is authorized to provide the prescribed services.
- .6 Assessments to be made will include, but are not limited to, the following systems, equipment, components or devices: liquid flow, pressure, temperature, head loss (or pressure drop), rotation speed in r / min, the electrical characteristics such as voltage, current intensity, etc.

Part 2 Products

NOT APPLICABLE

Part 3 Execution

NOT APPLICABLE

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Domestic water piping , materials and related installation methods, including the following :
 - .1 Domestic water piping , in copper, up to DN 4;
 - .2 Domestic hot water and cold water, in copper, up to DN 4;
 - .3 Domestic water piping in stainless steel of size DN 2½ and over;
 - .4 For sizes DN 2 ½ to DN 4, the Contractor has the choice of equipment.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
 - .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
 - .5 ANSI/ASME B36.19 Stainless Steel Pipe.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM B 88, Standard Specification for Seamless Copper Water Tube).
 - .3 ASTM A 312, Standard Specification for Seamless and Welded Austenitic S.S. Pipe.
- .3 American Water Works Association (AWWA).
 - .1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
 - .2 CSA B125.1-05 and B125.3-05 Plumbing Supply Fitting.
- .5 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).

- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67, Butterfly Valves.
 - .2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction.
 - .1 NRCC, National Plumbing Code of Canada (NPC) – 2010 and modifications for province of Quebec.
- .9 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34
- .10 Refer to the most recent versions in effect.

1.3 ACTION AND INFORMATION SUBMITTALS

- .1 Submit manufacturer's data sheets, specifications, and product literature in accordance with the "Action and information submittals" clause of Section 20 05 01.

Part 2 Products

2.1 PIPING

- .1 Hot and cold water piping (distribution, supply and recirculation) located inside the building
 - .1 To install aboveground: copper tubes hardened, L-type, in accordance with ASTM B 88 up to DN 2.
 - .2 To bury or flood: K-type annealed copper tubes, in accordance with ASTM B 88, in long lengths with no joints in the part to bury up to DN 2.

2.2 JOINTS AND FITTINGS

- .1 For copper piping
 - .1 Molded Bronze Couplings, Class 125 and 250: in accordance with ANSI / ASME B16.15.
 - .2 Molded Copper Solder Fittings: in accordance with ANSI / ASME B16.18.
 - .3 Copper and forged copper alloy fittings to be welded: in accordance with ANSI / ASME B16.22.
 - .4 Soft welds for copper piping : tin-antimony 95/5.
 - .5 Teflon tape: for screw joints.
 - .6 Dielectric fittings between elements made of different metals: in accordance with ASTM F 492, for thermoplastic liner.
 - .1 Watts, Zurn.
 - .2 Required location between: copper and black steel, copper and stainless steel.

2.3 LEAD FREE PRODUCT

- .1 All materials used in contact with drinking water shall conform to NSF / ANSI 372 and no alloy can contain more than 0,25 % lead.

2.4 BALL VALVES

- .1 Ball valves, of nominal diameter equal to or less than DN 2, to be welded
 - .1 Valves in accordance with MSS SP-110, Class 150.
 - .2 Bronze body, stainless steel spherical shutter, adjustable PTFE gasket, brass press gasket, PTFE seat, steel lever.
 - .3 Nibco S-585-66 -LF or equivalent.

Part 3 Execution

3.1 PIPING INSTALLATION

- .1 Install in accordance with the National Plumbing Code as well as modifications for the Québec province.
- .2 Install pipe work in accordance with Section 23 05 05 – " Piping installation ", and supplemented as specified herein
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction. Minimize the use of fittings.

3.2 VALVES

- .1 Install shut-off or isolation valves in accessible locations.
- .2 Install valves so that they are accessible for maintenance without the need to disassemble adjacent piping.

3.3 PRESSURE TESTS

- .1 Comply with the requirements of section 22 05 01 regarding the results of the work.
- .2 Perform tests at a pressure corresponding to the highest of the following values, ie 860 kPa or the maximum operating pressure.

3.4 PRE-START-UP INSPECTIONS

- .1 Systems must be complete, prior to flushing, testing and start-up.

- .2 Verify that system can be completely drained.
- .3 Ensure that air chambers and expansion compensators are installed properly.

3.5 START-UP

- .1 Timing: Start up after:
 - .1 Pressure tests have been completed.
 - .2 Cleaning and disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems are operational.
- .2 Provide continuous supervision during start-up
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation of the system
 - .3 Check control, limit, and safety devices for normal and safe operation. Monitor piping of hot water supply and hot water circulation piping
 - .4 systems for freedom of movement, pipe expansion as designed.
- .4 Rectify start-up deficiencies.

3.6 PERFORMANCE VERIFICATION

- .1 Proceed to verification of system performance.
 - .1 Once pressure and leakage tests are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 Verify performance of temperature controls.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Cast iron and copper piping for sanitary , storm and vent , materials and related installation methods, including :
 - .1 Vent and sanitary copper piping, maximum NPS 3

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM B 32, Specification for Solder Metal.
 - .2 ASTM B 306, Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C 564, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - .4 ASTM A 312. Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125, Plumbing Fittings
 - .4 American Iron and Steel Institute
 - .1 AISI 304, Stainless Steel
- .3 National Research Council (NRC)/Institute for Research in Construction.
 - .1 NRCC 38728F, National Plumbing Code of Canada (NPC) – 2010 including modification for the province of Quebec.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide manufacturer's printed product literature and datasheets for products in accordance with Section 20 05 01- Submittal Procedures

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary, storm and vent Type DWV maximum NPS 2 or lower to: ASTM B306
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.
 - .2 Wrought copper: to CAN/CSA-B125.
 - .2 Solder: tin-lead, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary, storm and vent minimum NPS 3 , to: CAN/CSA-B70, with one layer of protective coating.
 - .1 Joints
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets: to CAN/CSA-B602
 - .2 T-304Stainless steel clamps.

Part 3 Execution

3.1 INSTALLATION

- .1 In accordance with Section 23 05 05
- .2 Unless otherwise specified, install in accordance with Quebec Plumbing Code, National Plumbing Code (Canada 2010).

3.2 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.3 PERFORMANCE VERIFICATION

- .1 Ensure that fixtures are properly anchored, connected to system and effectively vented.

FIN DE LA SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes:
 - .1 Materials and installation for plumbing specialties and accessories.

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA).
 - .1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.
 - .3 AWWA C702-1, Cold Water Meters-Compound Type.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA-B64 Series-01, Backflow Preventers and Vacuum Breakers.
 - .2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
 - .3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 Plumbing and Drainage Institute (PDI).
 - .1 PDI-G101-[96], Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
 - .2 PDI-WH201, Water Hammer Arresters Standard.

1.3 ACTION AND INFORMATION SUBMITTALS

- .1 Submit manufacturer's data sheets, specifications, and product literature in accordance with the " Action and information submittals " clause of Section 20 05 01
- .2 Provide data sheets for the following components and equipments: valves, piping.
- .3 Provide the required maintenance sheets and attach them to the manual referred to in section 01 78 00 - Documents / Deliverables upon Completion.

Part 2 Products

2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains will conform to CSA B79.

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 data sheets.

3.2 INSTALLATION

- .1 Install in accordance with the National Plumbing Code of Canada and Quebec Plumbing Code.
- .2 Install special plumbing equipments in accordance with the manufacturer's instructions and as specified.

3.3 DRAIN FAUCETS

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.4 START-UP

- .1 Timing: start-up only after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems are operational.
- .2 Provide continuous supervision during start-up.

3.5 TESTING AND ADJUSTING

- .1 Timing:
 - .1 After start-up deficiencies have been rectified.
 - .2 After the certificate of completion has been issued by the authority having jurisdiction.

END OF SECTION

Part 1 General Information

1.1 REQUIREMENTS

- .1 General requirements
 - .1 Refer to section 20 05 01.
- .2 Distribution of sections
 - .1 For the distribution of sections according to the responsible specialty, refer to the table of contents for mechanical and electrical work.
 - .2 For earthquake resistance measures, refer to section 20 05 01.

1.2 CODES AND STANDARDS

- .1 Refer to section 20 05 01.
- .2 Fully implement and comply with the Quebec Construction Code (CCQ), Chapter V – Electricity.

1.3 EARTHQUAKE RESISTANCE MEASURES

- .1 Refer to section 20 05 01.

1.4 COORDINATION WITH OTHER SPECIALTIES

- .1 Refer to section 20 05 01.
- .2 Actively participate in the above, provide all the required information and follow the arrangements agreed between the specialities.
- .3 Be responsible for any required changes in location resulting from a failure to comply with the above.

1.5 SCOPE OF WORK

- .1 The “Electricity” work consists of providing and installing all the equipment, conduits and accessories as indicated on the electrical drawings and as described in Division 26 of the specifications.
 - .1 The “Electricity” work also consists of the following:
 - .1 Provide, install and connect the various equipment and accessories of the following special systems:
 - .1 Fire alarm
 - .2 Carry out the electrical equipment designation in accordance with section 20 05 53.
 - .3 Provide all the earthquake resistant fastening systems for piping and electrical appliances in accordance with section 20 05 01.
 - .4 Carry out all demolition work and remove the equipment and piping that must be removed.

1.6 DOCUMENTS AND SAMPLES TO BE SUBMITTED

- .1 Submit all the required documents and samples in accordance with section 20 05 01.

1.7 PARTICULARITIES AND INSTALLATION RELATIVE TO ELECTRICAL WORK

- .1 Ensure that maintenance, dismantling and replacement of the equipment can be done with as little displacement of the cable trough connectors as possible and without the building's structural components or any other installation constituting an obstacle.
- .2 Install all major equipment such as switching cabinets, 500-kVA transformers and above, on a 100-mm thick slab with bevelled edges and a 50 mm overhang around the appliances for easy maintenance.
- .3 In the basement, install all equipment to be supported by the floor on a 100-mm thick slab around the appliances for protection and easy maintenance.

1.8 SLEEVES

- .1 Refer to section 20 05 05.
- .2 For all sleeves used for electrical wiring and telecommunications through a firewall, select a resealable sleeve such as a Hilti #CP653 or an equivalent type.

1.9 MATERIALS AND EQUIPMENT

- .1 Provide the equipment in accordance with sections 01 61 00 and 20 05 01.
- .2 All materials and equipment must be new and approved by CSA or any other organization recognized by Chapter V of CCQ. In cases where there is no alternative but to provide unapproved equipment, it is the specialty's responsibility to obtain special approval. Any challenge to this requirement is not acceptable.
- .3 Control panels and components must be factory assembled.

1.10 NOMINAL VOLTAGE

- .1 The operating voltages must be compliant with standard CAN3-C235-83 (2010).
- .2 All motors, electric heating equipment, and control and distribution devices must function satisfactorily at nominal voltages of 120, 208, 240, 347 or 60 V, at a frequency of 60 Hz and within the standard limits established by the previously named standard. The material must be able to function in the extreme conditions defined in this standard without becoming damaged.

1.11 PROTECTION AND WARNING SIGNS

- .1 Throughout the construction work, protect the exposed or live materials to ensure staff safety.
- .2 Enclose and mark off all live equipment by writing "circuit sous tension XXX V" (or the appropriate voltage) in French.
- .3 See to the installation of interim doors to close the rooms containing electrical distribution materials. Keep these doors locked, except when an electrician is directly monitoring them.

- .4 Provide warning signs based on the requirements of the electrical equipment inspection organization, the Engineer, Architect and the Owner. Use decalcomania of at least 175 mm x 250 mm.

1.12 ELECTRICAL EQUIPMENT FINISHES

- .1 In addition to the provisions specified in section 20 05 01, ensure the metal casing surfaces are shop-finished: remove rust and mill scale, clean, apply an anti-rust primer on the inside and outside, and provide at least two (2) coats of enamel finish.
 - .1 Paint the outdoor electrical equipment in machine green according to standard EEMAC Y-1-2-1-1979.
 - .2 Paint the indoor switching and distribution equipment cabinets in light grey according to standard EEMAC 2Y-1-1958, unless otherwise stated.
- .2 Paint the entire surface of the shop-finished equipment that has been scratched or damaged during shipping, installation and/or construction. Sand the surface to be painted, apply two coats of primer, then one coat of paint that matches the original colour. Primer and paint coats should be applied using an electrostatic process.
- .3 Clean exposed, non-galvanized hooks, brackets, fasteners and other fastening devices, and apply a primer to protect them against rust.

1.13 ELECTRICAL EQUIPMENT DESIGNATION

- .1 Designate the electric equipment (devices, panels, interrupters, starters, etc.) using the following identification plates.
- .2 Indication plates:
 - .1 Plastic Lamicaid plates to be engraved are 3-mm thick, mechanically secured using self-tapping screws and have a black background and a white core.

INDICATION PLATES FORMAT			
Format 1	10 x 50 mm	1 line	Letter height of 3 mm
Format 2	12 x 70 mm	1 line	Letter height of 5 mm
Format 3	12 x 70 mm	2 line	Letter height of 3 mm
Format 4	20 x 90 mm	1 line	Letter height of 8 mm
Format 5	20 x 90 mm	2 line	Letter height of 5 mm
Format 6	25 x 100 mm	1 line	Letter height of 12 mm
Format 7	25 x 100 mm	2 line	Letter height of 6 mm

- .2 The terms to be written on the identification plates must be verified by the Engineer before being made.
- .3 Provide sufficient space for about twenty-five (25) letters per plate.
- .4 The inscriptions must be French.
- .5 The identification plates for the terminal block boxes and junction boxes must indicate the network and/or voltage characteristics.
- .6 The identification plates placed on isolating switches, starters and contact switches must indicate the device controlled, the isolating switch, starter or contact switch number and the power panel number with the number of associated circuit(s).

- .7 The identification plates for the terminal block boxes and pull boxes must indicate the network and voltage.
- .8 The identification plates on the transformers must indicate the power and the primary and secondary voltages.
- .9 Identify the circuits using typewritten cards in the panels. The project number must be indicated on the schedule. Submit the schedules for the panels for approval before their fabrication and/or installation.
- .10 In the distribution panels supplying the heat pumps, each circuit must be identified with the heat pump number, zone number and non-fusible switch number.
- .11 In the existing electrical panelboards, identify all the existing, modified or cancelled circuits affected by the present work using a typewritten card which must be approved by the Engineer and fixed inside the panel's door. Keep the old card and note "RÉVISÉ EN DATE DU ____".
- .12 Identify electrical outlets and breakers with the panel number and the power circuit number using plastic adhesive tape (P-Touch). The labels must be transparent with black or red (if emergency) writing for power circuits, and with red writing for emergency supply circuits.
- .13 Identify each junction box as follows: unless otherwise stated, paint the entire perimeter of the junction boxes according to the color code, except for the lid. Using an indication plate, identify the source (panel) and circuit number(s) of any wiring passing through the junction boxes and pull boxes on the lid. Also identify the voltage.

1.14 IDENTIFICATION OF THE WIRING AND CIRCUITS

- .1 Using numbered or coloured plastic tape, permanently and indelibly mark the end points of the phase conductors of each feeder and each branch circuit.
- .2 Retain the order of the phases and the same colour coding for the entire installation.
- .3 The colour coding must be compliant with CSA standard C22.1.

1.15 IDENTIFICATION OF CONDUITS AND WIRES

- .1 Attribute a colour coding to the conduits, boxes and metal sheathed cables.
- .2 The conduits of the fire alarm, data/IT and optic fibre must be coloured on their entire length.
- .3 For all conduits and cables other than the ones mentioned in Article 2, use plastic tape or paint as colour coding every 3 m and wall, ceiling and floor crossover points.
- .4 The base colour strips must be 25 mm wide and complementary colour strips must be 20 mm wide.

	Colour of the conduit	Colour of the tape	Complementary colour
Up to 250 V	Grey	Jaune	
Up to 600 V	Grey	Jaune	Green
Up to 5 kV	Grey	Jaune	Blue
Up to 15 kV	Grey	Jaune	Red
Fire alarm	Red	---	---
Emergency communications	Grey	Red	Blue
Other security systems	Grey	Red	Green
M.A.L.T.	Grey	Green	
Telephone	Grey	Green	Blue
Other communication networks	Grey	Green	Blue
Data/IT	Blue	---	---
Optic fibre	Blue	Orange	---
Building management system	Grey	Orange	---
Access control	Grey	Blue	---
Cameras	Grey	Violet	---
Intercom	Grey	Black	---

1.16 MANUFACTURER AND CSA LABELS

- .1 Once the equipment is installed, the manufacturer's and CSA labels must be clearly visible and legible.

1.17 WIRING TERMINALS

- .1 The terminals, thimbles and screws used to connect the wires must be suitable for copper or aluminum conductors based on the wire used.

1.18 LOCATION OF ELECTRICAL OUTLETS AND PLUGS

- .1 Do not install electrical outlets and plugs back-to-back in a wall; leave a horizontal clearance of at least 150 mm between boxes.
- .2 The location of electrical outlets and plugs may be changed for no additional cost or credit, provided that the change in location does not exceed 3,000 mm and that a notice is given prior to installation.
- .3 Place the light switches near the doors, on the handle side. In the mechanical installations and elevator machinery rooms, place the isolating switches near the doors, on the handle side.

1.19 MOUNTING HEIGHTS FOR OUTLETS AND ELECTRICAL EQUIPMENT

- .1 Unless otherwise stated, all heights must be taken from the finished floor to the centre of the devices.
- .2 In cases where the mounting height is not indicated in the following table, check with the supervisor before beginning installation.

- .3 At locations designated by the Architect and in order to meet the barrier-free design standard, install electrical equipment at the following heights:

DESCRIPTION	HEIGHT (mm)
- Lighting switches in general	1,370 mm
- Wall plugs in general	300 mm
- Telephone/IT outlets in general	300 mm
- Manual fire alarm pull station	1,100 mm
- Fire alarm, from the floor	2,400 mm
- Fire alarm, from the ceiling	300 mm
- Electrical panelboards: in accordance with CCQ provisions or indications	

1.20 ELECTRICAL LOAD BALANCING

- .1 Measure the phase current from the distribution panels under normal charges (lighting) at the time of receipt of work. Distribute the branch circuit connections to obtain the best balance of the current between the various phases and note the changes made to the original connections.
- .2 Measure the phase voltages to the devices and regulate the transformer outlets so that the voltage obtained is within 2% of the nominal voltage of the devices.
- .3 Upon completion of the work, issue a report indicating the flow current under a normal charge identified on the phases and the neutral conductors of the distribution panels, dry transformers and motor control stations. Specify the date and time at which each charge was measured, as well as the voltage of the circuit at the time of verification.

1.21 SERIES PROTECTION

- .1 Series protection is not acceptable.

Part 2 Products

NOT APPLICABLE

Part 3 Execution

NOT APPLICABLE

END OF SECTION

Part 1 General Information

1.1 DEFINITIONS

- .1 Dismantling work
 - .1 Dismantling work refers to all disconnection, removal, recovery and storage of existing electrical materials to be reused and/or returned to the owner.
- .2 Demolition work
 - .1 Demolition work refers to all removal and evacuation of the site, existing electrical equipment and/or materials that will not be reused and/or recovered by the owner.

1.2 COORDINATION

- .1 All work will be completed by taking into account that there should not, at any time, be any interruption to the company's normal operations.

Part 2 Products

2.1 REINSTALLED EXISTING EQUIPMENT

- .1 Before installing reused existing electrical equipment, clean, check and refurbish it. Replace all missing and/or defective parts.
- .2 Unless otherwise stated, all retained and reinstalled existing fixtures will be equipped with new tubes and/or bulbs.
- .3 Close all open knockouts of the equipment to be reused.

Part 3 Execution

3.1 DISMANTLING WORK

- .1 All dismantling work on existing electrical equipment to be reused must be carried out by the electrical contractor in coordination with other specialties and under the General Contractor's responsibility.
- .2 Before dismantling existing electrical equipment to be retained, the electrical contractor must inspect the said equipment and report in writing, to the owner's representative, any detected breakages and/or defects. Otherwise, the equipment will be considered in perfect condition and any subsequently detected breakage or defect must be repaired at the electrical contractor's expense.
- .3 The retained electrical equipment must be temporarily stored by the electrical contractor who, as a result, will take full responsibility for it. No additional cost will be granted for the replacement of missing and/or damaged equipment while it was stored.

- .4 When reinstalling retained electrical equipment, the electrical contractor must provide all the necessary mounting brackets and other accessories to ensure a complete and perfectly functioning installation.
- .5 Re-identify the retained and reinstalled electrical equipment as shown in the drawings.

3.2 DEMOLITION WORK

- .1 Pre-demolition work
 - .1 Before proceeding with the demolition of existing electrical equipment, the electrical contractor must carry out the following preliminary work:
 - .1 Turn off the feeders supplying the electrical equipment to be demolished.
 - .2 Disconnect the retained equipment from the existing circuits to be removed and ensure electrical continuity of the retained circuits or supply them from a new circuit from a retained existing electrical panel.
 - .3 Dismantle existing equipment to be reused and/or retained.
- .2 Demolition work
 - .1 All demolition work will be carried out by the electrical contractor in coordination with other specialties and under the General Contractor's responsibility.
 - .2 Existing electrical equipment to be disconnected or removed is not fully indicated on the drawings, it is the electrical sub-contractor's responsibility to visit the site in order to properly assess the extent of demolition work relative to its specialty.
 - .3 Plan for the removal of the existing electrical equipment that will not be reused, such as: fixtures, electrical outlets, switches, distribution boards, starters, telephone outlets, computer outlets, fire alarms, access control devices, etc.
 - .4 Disconnect and remove up to its power source any feeder supplying a removed and not-reused existing mechanical and/or control device. The device remains the property of the mechanical specialty.
 - .5 In general, the equipment that is removed, but not reused, will become the property of division 16 and must be removed from the site. However, return to the owner the existing equipment he identified as recovered materials.
 - .6 When existing electrical equipment is removed, its existing electrical supply, wires and conduits, must be dismantled up to the electrical panel from which the supply originates, if no other existing equipment is supplied by that feeder, or up to the first retained existing equipment that is supplied by that feeder.
 - .7 Rewire the circuits that will have been cut by the demolition or by the cutting of existing surfaces.
 - .8 Remake the electrical continuity of the retained outlets and/or equipment and use the existing or new branch boards to supply the retained circuits by adding the required circuit breakers.
 - .9 When required, disconnect and remove the electrical equipment to allow the work of other specialties and reconnect them after the work.
 - .10 Plan for the sealing of openings left in existing walls and/or floors to be retained during the demolition and/or dismantling of existing feeders. For fire separations, either walls or floors, use an intumescent sealant.

- .11 During demolition work, in a building that remains occupied, ensure that the fire alarm system remains operational at all times. In the areas affected by the work, temporarily replace smoke detectors with thermal detectors for the duration of the work. At the end of the work, reinstall the smoke detectors at their original location or as indicated on the drawings.

END OF SECTION

Part 1 General Information

1.1 SUMMARY

- .1 Section includes
 - .1 Description of the wiring required to power the equipment shown on the drawings and as indicated.

1.2 REFERENCES

- .1 National Building Code of Canada (NBC) and its supplements
- .2 Quebec Construction Code – Chapter I – Building.
- .3 CSA C22.10 Canadian Electrical Code, Part I and Quebec's modifications.
- .4 CSA C22.2 No. 0.3, Test methods for electrical wires and cables.

1.3 DOCUMENTS AND SAMPLES TO BE SUBMITTED

- .1 Submit the required data sheets as well as the manufacturers' specifications and documentation for the products in accordance with section 20 05 01 – Documents and samples to be submitted. Specify product characteristics, performance criteria and constraints.

Part 2 Products

2.1 CONDUCTORS

- .1 All conductors will be copper.
 - .1 The feeder will not be used to supply any mechanical equipment or apparatus.
 - .2 If required, the Contractor will replace, at his own expense, the thimble connections of the equipment.
 - .3 All modifications will be recorded on the copy of the plans, as executed.

2.2 BUILDING WIRING

- .1 Copper wiring, solid conductors for gauges 10 AWG and lower, then stranded for gauges 8 AWG and higher.
- .2 Copper conductors, minimum size 12 for power and minimum size 14 for controls, and according to the specifications on the drawings.
- .3 Chemically cross-linked thermosetting polyethylene.
- .4 For general use: RW-90 XLPE, isolated at 600 V.
- .5 For powering a variable frequency drive, RWU-90° isolated at 1000 V.

- .6 For underground use, RWU-90 (-40°C) XLPE, isolated at 1,000 V. (Use of RW wires for underground work will not be accepted.)
- .7 Armoured cables
 - .1 Conductors: copper, of the size indicated, covered with chemically cross-linked thermosetting polyethylene insulation, RW-90°.
 - .2 AC90 cable with copper conductors under a metal armour made of aluminum strips.

Part 3 Execution

3.1 INSTALLATION OF THE BUILDING WIRING

- .1 Install the cable as follows:
 - .1 In conduits, in accordance with section 26 05 33.
- .2 Retain the order of the phases and the colour coding for the entire installation.
- .3 Particular care of the phases and colour coding for the entire installation.
- .4 Particular care must be taken if it is necessary to install the wiring when the building temperature is between -9.5°C and -1.1°C. When the temperature is lower than -9.5°C, consult the Engineer
- .5 For the size of the wires, notwithstanding the instructions on the drawings and specifications, take the necessary steps so that the voltage drop does not exceed 3% between the secondary of the power transformer and any other device in use, when all devices are in service. In the event that the poor function of a device is due to a voltage drop of more than 3%, make the necessary corrections without any additional cost.
- .6 The electrical joints are mechanically rigid, and then covered in a connector of the type Marr, Marrette, and according to the manufacturer's instructions.
- .7 The terminals, thimbles and screws used to connect the wires must be suitable for copper or aluminum conductors based on the wire used.
- .8 No grease product will be accepted to facilitate the passage of wires in the conduits. Cable lubricant, chalk, talc or mica powder will be used.

3.2 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible.
- .2 Ensure cable termination in accordance with section 26 05 20 – Cable and Box Connectors, 0-1000 V.
- .3 Install an anti-short bushing on each end.
- .4 Armoured cables shall only be used when concealed in walls and/or ceilings and shall only be permitted in the following cases:
 - .1 Maximum length of 3 m;
 - .2 For connections between junction boxes installed in the ceiling space and recessed and mounted luminaires;

- .3 For vertical wall downpipes to connect the existing wiring devices to the junction box located in the ceiling space;
- .4 Daisy chain connection is not permitted.

END OF SECTION

Part 1 General Information

1.1 SUMMARY

- .1 Section includes
 - .1 Wire and box connectors, materials and related equipment as well as their installation.

1.1 REFERENCES

- .1 CSA C22.2 No. 65, Wire Connectors
- .2 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (nominal current of 1,200 A).

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors compliant with CSA standard C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors compliant with CSA standard C22.2 No. 65, with current carrying parts of copper sized to fit 10 AWG copper conductors or less.
- .3 Bushing stud connectors compliant with standard EEMAC 1Y-2 consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for copper bar.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper bar.
 - .5 Sized for conductors, as indicated.
- .4 Clamps or connectors for armoured cables, compliant with CAN/CSA-C22.2 No. 18.

Part 3 Execution

1.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors and tighten screws. Installation must meet secureness tests in accordance with CSA standard C22.2 No. 65.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.
 - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.
 - .4 Use the appropriate crimpers for connector models and sizes, as recommended by the connector manufacturer.
 - .5 For the connection of equipment and fixtures in places where space is limited, use 90° angled connectors.

END OF SECTION

Part 1 General Information

1.1 SUMMARY

- .1 Section includes
 - .1 Conduits required for the wiring to power the equipment shown on the drawings and as indicated.
 - .2 Outlet boxes and connectors required for a complete installation of the networks and according to the specifications.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA).
 - .1 CSA C22.2 No. 45 "Rigid Metal Conduit".
 - .2 CSA C22.2 No. 56 "Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit".
 - .3 CSA C22.2 No. 83 "Electrical Metallic Tubing".
 - .4 CSA C22.2 No. 211.2 "Rigid PVC (Unplasticized) Conduits".
 - .5 CAN/CSA-C22.2 No. 27.3 "Flexible Nonmetallic Tubing".
 - .6 CAN/CSA-C22.2 No. 18 "Outlet Boxes and Fittings".

1.3 DOCUMENTS AND SAMPLES TO BE SUBMITTED

- .1 Submit the required data sheets as well as the manufacturers' specifications and documentation for the products in accordance with section 20 05 01. Specify product characteristics, performance criteria and constraints.

Part 2 Products

2.1 BOXES

- .1 Outlet boxes for general use
 - .1 Hot dipped galvanized steel outlet boxes, single, 347 V, for flush installation, minimum size 76 mm x 50 mm x 38 mm or as indicated. These boxes can be grouped when several wiring devices are installed at the same location.
 - .2 Hot dipped galvanized steel outlet boxes, single, for flush installation, minimum size 76 mm x 58 mm x 63 mm or as indicated. These boxes can be grouped when several wiring devices are installed at the same location.
 - .3 Hot dipped galvanized steel outlet boxes, 102 mm square when more than one conduit enters one side with extension and plaster rings, as required.
 - .4 102 mm square or octagonal hot dipped galvanized steel outlet boxes for lighting fixture outlets.
 - .5 Hot dipped galvanized steel outlet boxes, 102 mm square when more than one conduit enters one side with extension and plaster rings, for devices embedded in finished plaster or ceramic tile walls.

- .2 Masonry outlet boxes
 - .1 Hot dipped galvanized steel outlet boxes for devices embedded in exposed masonry walls (concrete blocks, bricks).
- .3 Concrete outlet boxes
 - .1 Hot dipped galvanized steel outlet boxes for devices embedded in concrete, with extension and plaster ring, as required.
- .4 Tight outlet boxes for devices on the surface
 - .1 Cast FS or FD cast iron boxes with factory-threaded hubs and mounting feet for surface wiring of switches and electrical outlets.
- .5 Outlet boxes for nonmetallic sheathed cable
 - .1 Hot dipped galvanized steel boxes, removable, can be grouped using screws, minimum size 76 mm x 50 mm x 63 mm, with two double flanges, for nonmetallic sheathed cable.
- .6 PVC outlet boxes for surface mounting
 - .1 PVC FS outlet box with grounding bar. The openings will be provided for gluing and equipped with mounting feet.
- .7 Pull and junction boxes
 - .1 Standard manufactured hot dipped galvanized steel boxes, 102 mm square or octagonal with blind lid.
 - .2 Custom-made pre-painted steel boxes compliant with CSA C22.10.10. These boxes may or may not have knockouts. When these boxes are intended for flush installation, the lid will protrude 25 mm on each side.
 - .3 Square or rectangular PVC boxes, minimum size 114 mm x 120 mm or 102 mm octagonal with openings of appropriate dimensions for gluing the conduits. These boxes will have a tight lid and mounting feet.
 - .4 Larger PVC boxes. These boxes may or may not have prefabricated openings. These boxes have a tight lid. PVC adapters and sleeves will be used for each of the drilled openings.
- .8 Splitter boxes
 - .1 Splitter boxes according to use and/or as indicated on the drawings.
 - .2 Boxes approved by standard C-22.10.10.
 - .3 Steel sheet splitter boxes of required dimensions to be suitable for all connected equipment.
 - .4 Splitter boxes fitted with terminal boards corresponding to the size and number of conductors that will be connected to them. Provide a minimum of three (3) free secondary connection terminals for future connections.
 - .5 Splitter boxes with hinged lids, fashioned and able to be locked in the closed position.
 - .6 Splitter boxes of 600 A and above will be equipped with bus bars with thimbles.

2.2 CONDUITS

- .1 Conduits – General
 - .1 All conduits must be certified for their intended use in accordance with CSA Code standard B.22.10.10.
 - .2 Conduits must have a minimum diameter of 21 mm unless otherwise stated.
 - .3 Aluminum conduits will not be accepted unless otherwise stated.
 - .4 Fibreglass conduits will not be accepted unless otherwise stated.
 - .5 Flexible polyethylene conduits will not be not accepted.
 - .6 The conduits used to run the fire alarm system wiring must be red and of the “Electrical Metallic Tubing (EMT)” type.
 - .7 The conduits used for the passage of telecommunication wiring must be blue and of the “Electrical Metallic Tubing (EMT)” type.
- .2 Electrical Metallic Tubing (EMT)
 - .1 Thin-walled electrical metallic tubing, made of corrosion-resistant hot dipped galvanized steel, with an inner coating to facilitate sliding between the tube and the wiring.

2.3 CONNECTORS

- .1 Common connectors
 - .1 Sleeves and connectors with insulated nylon collars.
 - .2 Pressure seals to prevent foreign bodies from penetrating the boxes and connectors.
 - .3 Outlet body for conduits up to 32 mm in diameter and pull boxes for conduits of larger dimensions.
 - .4 Metal end caps with nylon throats of appropriate size for conduit diameter, such as Thomas & Betts series 1222 to 1231.
- .2 Clamping screw connectors for electrical metallic tubing (EMT)
 - .1 Zinc alloy connectors for electrical metallic tubing with single screw couplings for pipes with a diameter of 41 mm and less, then with double screw couplings for pipes with a diameter of 53 mm and more.
 - .2 Acceptable products:
 - .1 Connectors with insulated collar: Iberville CI5004 series -IT to CI5032-IT or approved equivalent.
 - .2 Couplings: Iberville series CI5104 to CI5132 or approved equivalent.
- .3 Tight compression connectors for electrical metallic tubing (EMT)
 - .1 Zinc alloy liquid-tight connectors with cast zinc lock nuts.
 - .2 Acceptable products:
 - .1 Connectors with insulated collar: Iberville series CI5804 -IT to CI5832-IT.
 - .2 Couplings: Iberville series CI5904 to CI5932.

2.4 CONDUIT FASTENERS

- .1 Fastening clamps to secure visible conduits.
- .2 Single-hole clamps to secure cables of 41 mm in diameter or less and two-hole clamps to secure cables of 53 mm in diameter or more.
- .3 Clamps made of flexible iron for rigid metal conduits and electrical metallic tubing.
- .4 Clamps made of PVC-coated steel for PVC conduit.
- .5 U-shapes to support several suspended lines.
- .6 Brackets to secure visible metallic conduits.
- .7 6 mm diameter threaded rods to support suspended lines.

Part 3 Execution

3.1 INSTALLING CONDUITS

- .1 General
 - .1 It is forbidden to use a corrosive product to unblock the conduits; open and replace the obstructed part of the conduit.
 - .2 Properly dry the conduits before running wires through them.
 - .3 Unless otherwise stated, conduits must not cross the framing components.
 - .4 Install the conduits parallel to the steam or hot water lines, leaving a lateral clearance of at least 75 mm and a vertical clearance of at least 25 mm between the conduits and the piping that cross each other.
 - .5 From each flush mounted panel, raise to ceiling void and lower to floor void, two 27 mm diameter spare conduits. The conduits must end up in a junction box measuring 152 mm x 152 mm x 152 mm x 102 mm housed in the ceiling; in the case of an exposed concrete slab, they must end up in boxes embedded in the slab.
 - .6 Provide and install a pull cord made of polypropylene in empty conduits to facilitate the eventual process of drawing in the wires.
 - .7 Conceal the conduits, except those found in the mechanical and electrical rooms and in areas where otherwise indicated.
 - .8 Bend the cold conduits so that crushing does not cause a decrease of more than 1/10 of the original diameter of the conduit. Consider that all curves that are twisted or that result in crushing greater than 1/10 are defective and replace the conduits.
 - .9 Mechanically bend steel tubes larger than 21 mm in diameter.
 - .10 For visible installations, install conduits that are glued to the ceiling and/or concrete slab so as not to reduce the height of the room. In addition, use "LB" type connectors to bypass visible beams.
 - .11 Use conduit support systems including: profiles, crossarms, cross members, brackets, fasteners, squares, anchors and accessories, such as Thomas & Betts, B-Line or an equivalent type to group multiple conduits.
 - .12 Install the conduits in a straight line following the building's grid lines.

- .2 Installing electrical metallic tubes (EMT)
 - .1 Place a protective cap on each of the open ends.
 - .2 Use single or double screw conduit connectors depending on conduit diameter.
 - .3 Use tight compression connectors when they are subject to water spray (other than sprinklers) or when required by the owner.
 - .4 Group conduits on conduit supports.

3.2 INSTALLING BOXES

- .1 General
 - .1 Secure the boxes so that they are supported independently of the conduits that are connected to them.
 - .2 Fill the boxes with paper, sponge, mousse or another similar approved material to prevent construction materials from entering them.
 - .3 Install embedded elements with the finished wall, use plaster rings and ensure that the edges of the wall covering terminate within 6.3 mm of the opening, in accordance with standard C22.10, clause 12 3018.
 - .4 Provide open boxes of suitable dimensions for connecting conduits and armoured cables. Use of reducing washers is forbidden.
 - .5 Do not install the outlets back-to-back in a wall; leave a horizontal clearance of at least 150 mm between the boxes.
 - .6 Modify the location of the electrical outlets without additional cost or credits, under the condition that the displacement does not exceed 3 m and that the change advice is given before the installation.
- .2 Surface installation
 - .1 All installation of wiring on the surface must be done using a box without slugs.
 - .2 Moulded boxes will be used for the installation of wiring devices.
 - .3 Sheet metal boxes with a lid can be used as junction boxes.
- .3 Installing splitter boxes
 - .1 Install the splitter boxes according to the instructions and mount them level, and lined up square with the building walls.
- .4 Installing junction and pull boxes
 - .1 Only the main junction and pull boxes will appear on the drawings. Provide a sufficient number of pull boxes so that the ducts installed between each box are no more than 30 m long. Provide a pull box at most for every four (4) direction changes.
 - .2 Install the pull boxes in concealed but easy-to-access areas.
- .5 Lids
 - .1 For the surface installations, the lids must cover the entire casing, up to their edges.
 - .2 For the embedded installations, the lids must cover the wall in which the casings are installed.
 - .3 Check with the architectural details to ensure that the casings and their lids fit perfectly.

- .6 Identification tags
 - .1 Refer to section 26 05 01.
 - .2 Provide and install the identification tags on the junction boxes, pull boxes and cabinets, format 2, indicating the name of the network, the current and the voltage used, as applicable

END OF SECTION

Part 1 General Information

1.1 SUMMARY

- .1 Section includes
 - .1 Various wiring devices.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-C22.2 n° 42, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 n° 42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 n° 55, Special Use Switches.
 - .4 CSA-C22.2 n° 111, General Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.3 DOCUMENTS AND SAMPLES TO BE SUBMITTED

- .1 Submit the required data sheets as well as the manufacturers' specifications and documentation for the products in accordance with section 20 05 01. Specify product characteristics, performance criteria and constraints.

Part 2 Products

2.1 MATERIALS

- .1 Unless otherwise stated, only use wiring devices of the same model and from the same manufacturer.
- .2 Unless otherwise stated, wiring devices will be white.

2.2 STANDARD SWITCHES

- .1 Single pole switches, three (3) or four (4) ways, 15 A, 120 V.
 - .1 Acceptable products:
 - Leviton, series 1200
 - Eaton-Arrow Hart, series 1200
 - Hubbell n° 1200
 - Bryant, series 4800
 - Legrand, series PS15 AC1
 - Or any other approved equivalent

2.3 ELECTRICAL OUTLETS

- .1 Electrical outlets: double, CSA configuration 5R-15, 125 volts, 15A, “U”-shaped ground.
 - .1 Acceptable products:
 - Leviton, series 5262
 - Eaton-Arrow Hart, series 5262
 - Hubbell, series HBL 5262
 - Bryant, series 5262
 - Legrand, series 5262
 - Or any other approved equivalent
 - .2 Double outlets, 15/20 A, 120 V, CSA configuration 5-20R, “U”-shaped ground.
 - .1 Acceptable products:
 - Hubbell, HBL5362
 - Eaton-Arrow Hart, AH5362
 - Leviton, 5362
 - Bryant, 5362-CAN
 - Legrand 5362
 - Or any other approved equivalent

2.4 OUTLETS WITH GROUND FAULT PROTECTION

- .1 Double outlets, 15 A, 120 V, 1P, CSA configuration 5-15R, ground fault protection, tamper resistant and compliant with hospital requirements.
 - .1 Acceptable products:
 - Leviton, series 16262
 - Eaton-Arrow Hart, series TRVGFH15
 - Hubbell, series GFR8200H
 - Bryant, series GF82TR
 - Legrand, series 1595 HGTR
 - Or any other approved equivalent

2.5 FACE PLATES

- .1 Fit the wiring devices with the appropriate face plates.
- .2 Face plates: stainless steel that is 1 mm thick for wiring devices mounted in an embedded outlet box.
- .3 Weatherproof cast aluminum face plate, spring loaded, with gaskets for outdoor outlets or as specified. Double wing plates for standard double outlets and single wing plates for decorative outlets.

- .4 Stainless steel blind face plate for unused outlets of telecommunication systems, television, cameras, etc.
- .5 Single hole stainless steel face plate for television systems, cameras, etc., as indicated.
- .6 Stainless steel face plate for modular telecommunication outlets, as indicated.
- .7 Galvanized steel plates for the elements mounted on the surface and secured using four (4) screws.
- .8 White face plate, made from quality nylon and compliant with commercial specifications, for decorative wiring devices mounted in an embedded outlet box. They will be Leviton's 804 series or equivalent.

Part 3 Execution

3.1 INSTALLATION

- .1 Unless otherwise stated, wiring devices must be installed at heights compliant with section 26 05 01.
- .2 Do not install the outlets back-to-back in a wall; leave a horizontal clearance of at least 150 mm between the boxes.
- .3 Place the light switches near the doors, on the handle side.
- .4 Unless otherwise stated, the position of the electrical outlets shown on the drawings is approximate.
- .5 The location of the electrical outlets in rooms with a decorative finish or prefabricated panels must be determined from the architectural drawings details.
- .6 When several electrical outlets must be installed side by side, they must be aligned horizontally or vertically, as applicable.
- .7 Do not install dimmers below thermostat.
- .8 Unless otherwise indicated by the Architect or otherwise stated, all heights must be taken from the centre of the devices and from the finished floor.
 - .1 Switches:
 - .1 Install the single-way switches so that the lever is in the up position when the contacts are closed.
 - .2 Install switches in grouped outlet boxes when more than one switch is required in the same location.
 - .3 In metal door frames, use a narrow switch and plate assembly and notify the Contractor so that he coordinates the required openings in these frames.
 - .2 Electrical outlets:
 - .1 Install the electrical outlets in groups of outlet boxes when more than one electrical outlet has to be installed in the same location.
 - .2 The outlets will be installed vertically, and the ground will be on the bottom.

- .3 Face plates:
 - .1 Protect the finish on the stainless steel face plates using a sheet of paper or plastic that will not be removed until painting or other work is completed.
 - .2 When the devices are grouped together, use one common face plate, as appropriate.

3.2 EMERGENCY

- .1 When connected to emergency circuits, switches, outlets and their face plates must be red.

3.3 IDENTIFICATION

- .1 Identify each of the electrical outlets using a transparent "P-Touch" label with black or red (if emergency) writing that states the panel and number of the power circuit. This label should be fixed to the top of the face plate.

END OF SECTION

Part 1 General Information

1.1 SUMMARY

- .1 Section includes
 - .1 Molded-case circuit breakers to protect circuits and connected equipment.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-C22.2 No. 5-13 "Molded circuit breakers, molded-cased switches and circuit-breaker enclosures (Tri-national Standard, with UL489 and NMX-J-266-ANCE-2013)".
 - .2 CSA C22.10, Canadian Electrical Code, Part I and Quebec's modifications.

1.3 DOCUMENTS AND SAMPLES TO BE SUBMITTED

- .1 Submit the required data sheets as well as the manufacturers' specifications and documentation for the products in accordance with section 20 05 01. Specify product characteristics, performance criteria and constraints.
- .2 Data sheets must include information on break capacities.

Part 2 Products

2.1 MATERIALS

- .1 Use molded-case circuit breakers from the same manufacturer providing the equipment in which they are installed.
- .2 For all circuit breakers to be provided, the Contractor must provide, with shop drawings, a certificate provided by the manufacturer confirming that the circuit breakers are new and come directly from the manufacturer through an authorized distributor.

2.2 MOLDED-CASE CIRCUIT BREAKER FEATURES

- .1 Molded-case circuit breaker bolted on bus bars: quickmake, quickbreak type, for manual and automatic operation with temperature compensation for 40°C room temperature and rated capacity of 100%.
- .2 Circuit breakers with a continuous duty factor of 80% of the rated capacity.
- .3 Common-trip circuit breakers equipped with a single handle on multipolar circuits.
- .4 Circuit breakers with magnetic instantaneous trip elements to operate only when value of current reaches setting. The setting value of circuit breakers with adjustable trips ranges from 3-10 times the rated current.
- .5 Circuit breakers with interchangeable trips, as indicated.

- .6 Circuit breakers must have a symmetrical rms breaking capacity of at least 10,000 A or as indicated.
- .7 Twin circuit breakers will not be accepted in the new distribution panels.
- .8 The minimum width of the circuit breakers is 20 mm.
- .9 Red circuit breaker for circuits supplying the fire alarm system.

2.3 CIRCUIT BREAKERS ADDED TO THE EXISTING PANELBOARDS

- .1 In the existing distribution and/or bypass panelboards, supply all the new circuit breakers required in accordance with the specifications in order to meet all the new power supplies indicated in the drawings.
- .2 The new circuit breakers must all come from the same manufacturer as the panelboards and have the same characteristics as the existing circuit breakers, taking into account that the most restrictive characteristics will be those required.
- .3 When indicated in the drawings, provide twin circuit breakers to contend with the lack of space, where standard circuit breakers would not fit.

Part 3 Execution

3.1 INSTALLATION - GENERAL

- .1 Install circuit breakers in accordance with specifications.
- .2 Provide a locking device (lock free) for circuit breakers in fire alarm circuits, exit signs, battery outlets and other circuits shown in the drawings.
- .3 Provide a locking device (with lock) for all circuit breakers in the distribution panels and all circuit breakers installed in the distribution and/or connection centres.
- .4 In existing distribution panels, if required, have the manufacturer's representative make any necessary modifications to the bus bars in order to add the new circuit breakers.
- .5 In the existing switch and/or distribution panels, provide all the new brackets and other mounting accessories required for the addition of new circuit breakers.

END OF SECTION

Part 1 General Information

1.1 SUMMARY

- .1 Section includes
 - .1 Provide, install and connect all lighting fixtures indicated in the drawings. These must be complete and equipped with all the accessories required to make a complete and perfectly functioning installation.

1.2 REFERENCES

- .1 National Building Code of Canada (CNB) and its supplements.
- .2 Quebec Construction Code – Chapter I – Building.
- .3 CSA C22.10, Canadian Electrical Code, Part I and Quebec’s modifications.
- .4 CSA C.22.2 No. 9.0 General Requirements for luminaires.
- .5 CSA C22.2 No. 43-08 Lamp Holders (Bi-national Standard, with UL 496).
- .6 CAN/CSA-E920-98, Ballasts for Tubular Fluorescent Lamps – General and Safety Requirements.
- .7 CAN/CSA-E922-98, Ballasts for Discharge Lamps.
- .8 CAN/CSA C22.2 No. 250.13-F14, Light Emitting Diode (LED) Equipment for Lighting Applications.

1.3 DOCUMENTS AND SAMPLES TO BE SUBMITTED

- .1 Submit the required data sheets as well as the manufacturers’ specifications and documentation for the products in accordance with section 20 05 01. Specify product characteristics, performance criteria and constraints.
- .2 Submit a complete data sheet for each type of lighting fixture prescribed in the drawings.
- .3 Submit ballast and driver data sheets.
- .4 Submit lamp and tube data sheets.
- .5 Provide a sample of any proposed luminaire model upon the Engineer’s request. This sample, if accepted, will remain in the Engineer’s possession until the work is completed.
- .6 For any luminaire proposed for equivalence, comply with the requirements of the “Acceptable products” clause in section 20 05 01. In addition to this clause, for all luminaire models presented as equivalent by the Contractor, other than those listed in the drawings, the Contractor must provide a detailed photometric study, point by point, clearly proving that his proposal meets the expected performance (intensity, uniformity, glare, etc.) or any other comparative parameter deemed appropriate. The results of the study will be compared with the results of the calculations made with the specified and the proposed fixtures. The used source computer files must be available.

- .7 For any luminaire proposed for equivalence, comply with the requirements of the "Acceptable products" clause in section 20 05 01.

Part 2 Products

2.1 GENERAL

- .1 All lighting fixtures must be approved by and bear the mark of one of the CSA-accredited organizations.

2.2 LED

- .1 Equip all luminaires with light emitting diode or diode plates suited to the type of luminaire and capacity indicated in the list of luminaires included in the drawings and having the following features:
 - .1 CRI of at least 80;
 - .2 3,000, 3,500 and 4,000 °K, as indicated
 - .3 Minimum of 95 lm/W
- .2 Indoor lighting
 - .1 All lighting fixtures must be positioned to be easily and quickly accessible for lamp and ballast maintenance.
 - .2 Appliances and LED lamps must comply with the following requirements:
 - .1 Each plate must comply with the recommendations of IESNA LM-80.
 - .2 Each solid-state luminaire must meet one of the following test methods:
 - .1 IESNA LM-79
 - .2 CISPR15
 - .3 D.O.E. (Department of Energy) Lighting Facts
 - .4 CALiPER, LED Product Evaluation Program
 - .3 LED fixtures must have a minimum lifetime of 50,000 hours measured at a 90% luminous flux, at a room temperature of 25 °C, and corresponding to a maximum lamp mortality rate of 10%.
 - .4 The chosen LED lighting fixtures must prevent direct vision of the beam emitted by the LEDs and must use optical devices to limit the direct or reflected perceived luminance. The type of light emitted by these fixtures must not be harmful to the eyes.
 - .1 Direct glare from each indoor lighting fixture must not be transmitted through the windows to the outside of the building.
 - .2 No bare lamps should be directly visible at any normal viewing angle.
 - .3 Limit the amount of UV radiation emitted by lighting fixtures.
- .3 Outdoor lighting
 - .1 Weatherproof LED fixtures, fully scrolling (without upward light contribution), wall mounted and compliant with LM79 and LM80 standards. The pilots of the outdoor fixtures must be able to start at temperatures up to minus 30 °C. The fixtures must be mounted in IP66 approved housing.

2.3 LUMINAIRE DETAILS

- .1 Provide and install brackets, angles, junction boxes and embedded or surface distribution boxes, if applicable.
- .2 Cold rolled, deep-drawn steel luminaire housings, 1 mm thick. Steel sheet reflectors with a minimum thickness of 0.85 mm.
- .3 Supply and install diffusers.
- .4 Provide and install gaskets, joints and strips to ensure the unit is tight.
- .5 Before ordering recessed fixtures, check the ceiling type indicated in the architectural plans and order the perfectly fitted fixtures, notwithstanding what is indicated in the specifications. Similarly, when the ceiling type is of metal slats or walls are corrugated sheet metal, provide frames that are approved by the Architect and Engineer to make an appropriate assembly.

2.4 LUMINAIRE FINISHES

- .1 Metal treatment before painting:
 - .1 Corrosion-resistant conversion coating compliant with standard CGSB31-GP-103Ma.
 - .2 Conversion coating for bottom painting, compliant with standards CGSB 31-GP-105Ma and 31-GP-106a.
- .2 The metallic surfaces of the housing and reflector must be covered with a layer of high gloss baked enamel to ensure a smooth and uniform finish, free from corrosion pin-holes and other imperfections.
- .3 Features of the reflector's and other internal surfaces' top coat:
 - .1 Whiteness, reflection factor of at least 85%.
 - .2 Paint film thickness: an average of at least 30 micrometres and never less than 25 micrometres.
 - .3 Gloss index of at least 80, based on lighting calculations for a 60° incidence measured with the Gardner lustrometer.

Part 3 Execution

3.1 INSTALLATION

- .1 Luminaires will only be installed when all the work that could damage or dirty them is completed.
- .2 The final location of the luminaires will be determined according to the final position of the partitions and architectural details.
- .3 Particular attention will be paid to locate the luminaires in the centre of the rooms and to properly align the continuous rows of fluorescents.
- .4 HO fluorescent luminaires must be installed with a minimum clearance of 150 mm between the luminaires and the ceiling to ensure the adequate cooling of ballasts.

3.2 WIRING

- .1 Connect fixtures to lighting circuits as indicated.

3.3 SUPPORTS

- .1 Luminaires shown in suspended ceilings must be supported by the ceiling framing and are subject to the Architect's approval.

3.4 SUSPENSIONS

- .1 Suspended luminaires must be suspended using a conduit with a diameter of approximately 9.5 mm and of appropriate length, threaded at each end. Nuts and lock nuts should be used at each end and hinges should be used for the ceiling. There will be at least one (1) conduit per 1,200 mm of fluorescent luminaire.

3.5 TESTS

- .1 Perform tests in accordance with section 20 05 01.
- .2 Check luminaires and replace lamps, ballasts and defective accessories.

3.6 WARRANTY

- .1 Replace any fixtures that have become defective within twelve (12) months of provisional acceptance of the electrical installation.

END OF SECTION