Travaux publics et Services gouvernementaux Canada

Public Works and Government Services Canada

Institute Maurice-Lamontagne

MODIFICATIONS TO THE RAW AND FILTERED SEA WATER PUMPING SYSTEMS R.071686.001 (PWGSC)

SPECIFICATIONS ISSUE FOR TENDER

Project prepared for
Public Works and Government Services Canada
Quebec Region

JULY 2016

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LIST OF PLANS

"RAW WATER"

General

Civil Engineering

Process Engineering

Structural Engineering

Ventilation and Controls

LIST OF PLANS (Continued)

"RAW WATER" (Continued)

Electricity

"FILTERED WATER"

General

Process Engineering

Structural Engineering

LIST OF PLANS (Continued)

"FILTERED WATER" (Continued)

Electricity

Plumbing

Cathodic protection

DIVISION 1 – GENERAL REQUIREMENTS

Part 1 General

1.1 DEFINITIONS

.1 The terms below, which are used in various sections of the specifications, are defined as follows:

.1 Client: Public Works and Government Services Canada (PWGSC).

.2 Departmental Representative: PWGSC's project manager.

.3 General Contractor: Any person, organization or company that signed a contract with the Client in order to execute the work required by the project, and holds a permit in accordance with the law which governs the professional qualifications of general contractors in the province of Quebec. The General Contractor is the principal contractor under the terms of the *Act Respecting Occupational Health and Safety* and must act as such before the "Commission des normes, de l'équité, de la santé et de la sécurité du travail" (CNESST) and fulfill his obligations.

.4 Project documents or plans and specifications: All of the tender documents, including the specifications, plans and engineering drawing mentioned in the list enclosed, as well as any drawing sent later about the same project.

.5 IML: Institut Maurice-Lamontagne in Sainte-Flavie.

1.2 INTERPRETATION

.1 Words, expressions and abbreviations with known technical or professional significance will be consistent in these specifications and drawings.

.2 The sizes and dimensions indicated in the drawings or represented with modules, lines, arrows or other graphic elements will take precedence.

.3 Precedence will be given to large scale plans and drawings. In addition, the most recent versions of applicable specifications and drawings will always take precedence.

.4 If dimensions indicated on the drawings with figures are inconsistent, refer to the Departmental Representative in order to obtain the applicable dimensions. Measurements based on scales indicated on drawings will not be taken into consideration for interpretation purposes.

.5 Any inconsistency between the specifications and the drawings will be submitted in writing to the Departmental Representative. The latter will make a final decision on the matter and reply in writing.

.6 The specifications and drawings are complementary. The requirements indicated on the former also apply to the latter. The structure to be built in accordance with the plans and specifications will constitute a complete structure in essence, i.e. all of the elements arising from the specifications and drawings will be included in the structure, even if all of the said elements are not mentioned specifically. The General Contractor will not profit from any involuntary error or omission that he may observe.

.7 If all of the work or material required is not specifically described or indicated, the relevant trade or specialty will provide the missing items or services and they will be of the best quality.

.8 For clarification purposes, the Departmental Representative may provide the General Contractor with additional drawings in order to ensure the proper execution of the work. Their scope and relevance will be the same as the plans mentioned in the contract documents.

1.3 SUMMARY OF THE WORK

.1 Summary of the work

The work required is to be carried out on the site of the Institut Maurice-Lamontagne (IML) in Sainte-Flavie, a marine research center.

The work basically consists in improving and/or replacing raw or filtered sea water pumping facilities.

Raw sea water pumping system

.1 Building a new water intake located on the river's bed;

.2 Adding access points for the cleaning of raw sea water mains;

.3 Replacing pumping facilities located in "Block B" of the IML complex (pumps and process engineering);

.4 Modifying the facility in order to allow backwashing for the purpose of cleaning the raw water mains;

.5 Modifying electricity, ventilation and controls (HVAC and process engineering);

.6 Other related work.

Filtered sea water pumping system

.1 Replacing the existing pumps (4) with new pumps;

.2 Replacing valves, flanges and supports in the wet well;

.3 Modifying access doors to the wet well;

.4 Replacing the wench to install and remove the pumps;

.5 Repairing the building's floor slab;

.6 Modifying the electricity, plumbing and controls (process engineering).

.2 This contract includes the following work (without being limited to):

.1 Demolition, including removing old concrete to recover some space;

.2 Demolishing concrete for the purpose of repairing the concrete slab and widen the access doors;

.3 Concrete work in order to build a new concrete base, repair the concrete slab, and build a new water intake, as well as new access to the mains;

.4 Excavation of trenches and fill work;

.5 Process engineering at the raw sea water pumping station;

.6 Mechanical engineering at the filtered sea water pumping station;

.7 Structural engineering work to provide access to filtered water;

.8 Electricity work for new connections;

.9 Ventilation work at the raw sea water pumping station;

.10 Modifications to the controls;

.11 Commissioning;

.12 All other related work.

1.4 RIGHTS, PERMITS AND CERTIFICATES

.1 The General Contractor will obtain all of the permits required in order to execute the work. He will comply with all of the federal, provincial and municipal regulations and with all other laws or regulations applicable in the context of this project. He will take responsibility for any violation of the relevant laws and regulations.

.2 The General Contractor will pay (at his own expense) to fulfill all his obligations regarding the safety measures required by the Quebec *Act Respecting Occupational Health and Safety*, as well as all the expenses related to said obligations.

.3 The General Contractor will provide all of the inspection certificates confirming that the structure complies with the requirements of the competent authorities.

.4 The Departmental Representative will be provided with a copy of the applications submitted to the authorities mentioned above and of the approvals and authorizations obtained.

1.5 PROTECTION OF EXISTING STRUCTURES

.1 The General Contractor will pay special attention to avoiding damages to existing structures and accesses. Thus:

.1 Protective covers will be installed in elevators if the latter are used;

.2 Protection devices will be installed in order to protect all stairways and parts.

.2 The General Contractor will be solely liable for damages to the existing infrastructures and he will restore them in accordance with the requirements of the Departmental Representative and in compliance with the most recent standards. All costs related to the hiring of experts, if applicable, and to the restoration of any damaged element will be at the General Contractor’s expense.

1.6 USE OF THE SITE BY THE GENERAL CONTRACTOR

.1 The General Contractor will only execute work and store material in the areas indicated by the Departmental Representative. Specifically, the General Contractor will mobilize his equipment, establish his storage areas and construction facilities or trailers where indicated by the Departmental Representative.

.2 In his bid, the General Contractor will take into account all of the expenses related to the transportation of material, equipment and workers.

.3 Material, equipment and stored materials will not be unduly accumulated or deposited in piles so as not to encumber the site. The material or equipment that will hinder the activities of the Departmental Representative or another contractor will be moved.

.4 For the entire duration of the work, the site will not be used to provide lodging or temporary lodging for the General Contractor’s employees.

.5 Upon reception of the required authorisation, the General Contractor will pay for the expenses related to the use of storage areas or for additional work necessary to complete the project.

1.7 USE OF THE SITE BY THE DEPARTMENTAL REPRESENTATIVE

.1 The Departmental Representative will occupy the site for the entire duration of the construction work and will continue to carry out normal activities during that time. The General Contractor will take the following items into consideration:

.1 The raw water system will not be used during construction;

.2 The filtered water pumping system will remain in operation (one side of the wet well only) during construction. The General Contractor will therefore operate the wells alternately and ensure that at least one (1) of the two (2) wells can be operated.

.2 The General Contractor will collaborate with the Departmental Representative in order to establish the work schedule in such a way as to avoid conflicts and facilitate the use of the site by the Departmental Representative.

.3 Maintenance will be carried out as usual.

.4 Access to the site will be maintained at all times.

1.8 MATERIAL REMOVED FROM THE SITE

.1 Unless otherwise indicated, the material to be removed from the site will become the property of the General Contractor and will be removed as soon as possible based on applicable regulations.

1.9 DEFINITION OF UNIT PRICES AND GLOBAL PRICE

.1 Each unit price or the global price of the contract is established as a lump sum, i.e. the General Contractor agrees to complete the work based on a predetermined price, be it at a loss or at a gain. The global price or the unit price for a given structure or service will compensate for all of the work, disbursements, expenses, payments, direct and indirect costs and profits, as well as all liabilities, obligations, events, omissions and/or errors attributable to the General Contractor.

.2 It follows that for this same unit price or global price, the General Contractor must provide the materials, labour, tools, equipment and accessories required for the completion of the work.

.3 The unit price or global price also includes the transportation and installation of the material, as well as all of the general business expenses, insurance, premiums and contributions, interests, rent, taxes and other incidental expenses.

.4 It also includes the cost of losses and damages resulting from the work, price and salary fluctuations, the risk to the business, strikes, delays not attributable to the Client, accidents, weather and any other unforeseen events or circumstances.

1.10 COST BREAKDOWN

.1 At the request of the Departmental Representative, the General Contractor will produce a breakdown of the costs related to the contract, including the global price of the contract, as per the instructions of the Departmental Representative. Once approved by the Departmental Representative, the cost breakdown will serve as a starting point for the calculation of progress payment.

1.11 REQUIRED DOCUMENTS

.1 One copy of each of the following documents will be kept at the construction site:

.1 Contract drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed shop drawings.
.5 List of shop drawings that have not been reviewed.
.6 Change orders.
.7 Other contract amendments.
.8 Reports of tests conducted on site.
.9 Copy of the approved work schedule.
.10 Health and safety plan and other documents related to safety.
.11 Any other required documents.

.2 It is strongly recommended that prior to submitting a proposal, the General Contractor should familiarize himself with the contract and examine the site in order to obtain all the information necessary for the satisfactory completion of the project. The lack of knowledge of the conditions will not constitute valid grounds to claim additional payment.

1.12 WORK SCHEDULE

.1 The General Contractor will proceed with due diligence and begin work preparations as soon as the contract is issued by the Client.

.2 Within ten (10) business days, the General Contractor will submit a work schedule that will include the various milestones and the expected completion date.

.3 Based on the work schedule, within (10) days following the awarding of the contract and in a form acceptable to the Departmental Representative, the latter will be provided with the submittal date for the shop drawings, the list of material and the samples.

.4 The Departmental Representative will revise the schedule at his discretion based on progress. The General Contractor will update the schedule weekly in collaboration with and as approved by the Departmental Representative.

1.13 CODES AND STANDARDS

.1 The entire structure will comply with the requirements of the contractual documents and the applicable requirements of the most recent edition of the documents issued by the following: the Canadian General Standards Board, the Canadian Standards Association

(CSA Group), the National Building Code of Canada (NBCC), the American Society for Testing and Materials (ASTM), the "Bureau de normalisation du Québec" (BNQ), the "Cahier des charges et devis généraux" (CCDG) and other standards and codes indicated herein.

1.14 QUALITY CONTROL AT THE CONSTRUCTION SITE

.1 The work will be executed by qualified certified workers or apprentices in accordance with the local law pertaining to labour training and qualification.

1.15 LABORATORY AND TESTING SERVICES

.1 Unless otherwise indicated, the Departmental Representative will choose the laboratory that will carry out testing and inspections, and will pay for the costs.

.2 Anticipate the need for safe work areas, as well as the necessary support, materials, services and coordination, in order to conduct testing based on the needs of the testing organization and in accordance with the approvals and authorizations granted by the Departmental Representative.

.3 If the test results show that the work does not meet the requirements of the specifications, the General Contractor will pay for additional tests that will verify if the corrective actions taken to remedy the situation are acceptable.

1.16 INSPECTIONS AND TESTS

.1 Unless otherwise indicated, the testing of materials and devices required in various sections of the specifications is under the responsibility of the General Contractor.

.2 Anticipate the need for the instruments, materials and qualified labour required to perform the tests.

.3 Once the tests are complete, the Departmental Representative will be provided with two (2) copies of the test report, in which the testing will be well documented.

.4 Additional tests may be carried out at the request of the Departmental Representative. The cost of these tests will be paid by the Departmental Representative.

.5 If the tests or inspections show that the work does not meet the requirements of the contract, the General Contractor will pay for the additional tests required by the Departmental Representative in order to verify if the corrective actions taken to remedy the situation are acceptable.

.6 The General Contractor will pay for the work required to uncover and restore structures that were covered before the execution and approval of the tests or inspections by the Departmental Representative.

1.17 SIGNS

.1 Anticipate the need for commonly known signs for traffic, information, instruction, material use and public safety purposes as per the instructions of the Departmental

Representative, in the two official languages, or use graphic symbols approved by the Departmental Representative.

.2 Advertisements at the work site will not be permitted.

1.18 IMPLEMENTATION OF THE WORKS

.1 Based on the control elevation and levels indicated on the plans, the General Contractor will establish the main profiles and alignments required to complete the work and supply all of the material required.

.2 The General Contractor will take all of the necessary actions to ensure that the marks and references are not moved during the execution of the work.

.3 The General Contractor will supply all of the material required to allow the Departmental Representative to make the verifications he deems necessary.

.4 Before beginning work, the General Contractor will verify all of the measurements on site and notify the Departmental Representative of any error or discrepancy.

.5 If nonconformities resulting from marking errors attributed to the General Contractor are observed during the execution of the work, the latter will redo the work at his own expense.

1.19 CLEANING

.1 The construction area will be cleaned as the work progresses. At the end of each work period, and more often if requested by the Departmental Representative, waste material will be removed, the materials to be used or reused will be deposited in piles and the site will be subjected to a general cleaning.

.2 Upon completion of the work, the scaffolds, temporary protections and surplus materials will be removed. Damages observed at this stage of the project will be repaired.

.3 The areas affected by the work included in the contract will be cleaned in order to return them to a condition at least equivalent to that which existed before construction, to the satisfaction of the Departmental Representative.

1.20 SURPLUS MATERIAL

.1 The General Contractor will transport and dispose of all of the waste material resulting from his work to a location approved by appropriate authorities.

.2 The General Contractor will be solely responsible for the consequences (damages, claims, etc.) related to the disposal of waste, as well as for eventual claims. The Departmental Representative will not accept responsibility for the disposal of waste material.

1.21 ERRORS OR OMISSIONS

.1 If, in the course of his work, the General Contractor finds differences between the plans and the physical conditions of the site or errors or omissions on the plans, he will immediately inform the Departmental Representative in writing. If the General Contractor

elects to proceed without informing the Departmental Representative, he will do so at his own risk until he receives an authorization from the Departmental Representative.

1.22 WEATHER CONDITIONS

.1 The General Contractor will not claim any additional amount of money due to inclement weather, including winter weather. He will plan his work based on the weather conditions likely to occur at the time of execution and include in his bid the sums that may be necessary to redo the work affected by weather, etc.

END OF SECTION

Part 1 General

1.1 ACCESS TO THE CONSTRUCTION SITE

.1 Temporary means to access the construction site, e.g. stairways, pathways, ramps or ladders, as well as scaffolding, distinct from finished structures and compliant with municipal, provincial or other regulations, will be designed, built and maintained.

1.2 USE OF THE SITE AND FACILITIES

.1 Inasmuch as possible, work will be carried out without restricting the use of the facility. The necessary actions will be taken in collaboration with the Departmental Representative in order to facilitate the execution of the work.

.2 The existing utilities will remain in operation and access to the construction site will remain open to construction personnel and vehicles.

.3 When safety will be compromised due to construction, anticipate the need for other temporary means of access in order to ensure the safety of the users and property.

.4 The Departmental Representative will provide sanitary facilities for the General Contractor's personnel. The General Contractor will provide maintenance for said facilities.

.5 Only the elevators, freight elevators, and escalators installed in the building will be used to move labour and materials.

.1 The inside walls of the elevators will be protected prior to their use through means approved by the Departmental Representative.

.2 The facilities will be protected against all damages. Anticipate the need for safety measures and avoid overloads.

.6 The lifting equipment will be protected through temporary means until permanent closures are installed.

1.3 MODIFICATIONS, REPAIRS OR ADDITIONS TO THE EXISTING BUILDING

.1 Inasmuch as possible, the operation of the building, the occupants and the normal use of the facility will not be disturbed by the work. All of the necessary actions will be taken in collaboration with the Departmental Representative in order to avoid disturbances and facilitate the execution of the work required.

1.4 EXISTING SERVICES

.1 The Departmental Representative and the public utilities will be informed of service interruptions and appropriate authorizations will be obtained.

.2 If tapping or connecting to existing networks is required, the Department Representative will be notified 48 hours prior to the interruption of service or power. The duration of the interruption will be as short as possible. Service interruptions are to take place outside of the usual business hours of the occupants of the building, and preferably during the week-end.

.3 Pedestrian and vehicular traffic will be maintained.

.4 Protection fences will be built in accordance with section 01 56 00 “Temporary barriers and enclosures”.

1.5 SPECIFIC REQUIREMENTS

.1 The work schedule for the work anticipated in the kick-off meeting will be submitted, taking into account that work during the night, evening and week-end is not permitted.

.2 The General Contractor will make sure that the staff that will work at the construction site will know and comply with the rules, especially those regarding fire and road safety, occupational safety and traffic in the rooms of the Institut Maurice-Lamontagne.

.3 Work will be carried out within the permitted limits and accesses.

.4 The General Contractor’s vehicles are not permitted outside of “Block B”.

.5 Unless otherwise indicated by the Departmental Representative, the delivery of materials should not take place during rush hours (between 7:00 AM and 8:00 AM and between 4:00 PM and 5:00 PM).

1.6 SECURITY

.1 Anticipate the need for temporary means to ensure security in the event that the latter should be compromised by the construction work required for this project.

.2 Safety authorizations

.1 All personnel assigned to perform work will be subjected to security checks. Required authorizations will be obtained for any person needing to access the work site.

.2 Required authorizations will be obtained in accordance with the requirements for any person who needs access to the work site.

.3 Labourers and members of the staff will be subjected to security controls every day, from the beginning of the work period. They will be given a pass, which they will wear on their person at any time and return at the end of the work period, after exit controls.

.4 The General Contractor’s staff will meet the security controls requirements of the Royal Canadian Mounted Police (RCMP) before being given access to the construction site in order to perform work.

.3 Security escort

.1 Exceptionally, personnel who are not reliable card assigned to carry out work will be escorted by a security guard when working in areas restricted to the public during normal business hours. They will be escorted everywhere, at all times, after normal business hours.

.2 Requests for escort will be submitted to the Departmental Representative at least 14 days in advance. Requests submitted within the set timeframe will be paid by

the Departmental Representative. The costs of escorts requested late will be paid by the General Contractor.

.3 Any request for escort may be cancelled for free if the notification is given at least four (4) hours prior to the scheduled escort. If notification is given too late, the cost of the escort will be paid by the General Contractor.

.4 The cost of the escort will be calculated based on the average hourly rate for the services of a security guard for a period of eight (8) hours if the escort was requested late, and for a period of at least four (4) hours if the cancellation notice is given too late.

1.7 SMOKE-FREE ENVIRONMENT

.1 Smoking is not permitted. The “No Smoking” instructions will be respected.

Part 2 Products

2.1 NOT APPLICABLE

.1 Not applicable.

Part 3 Execution

3.1 NOT APPLICABLE

.1 Not applicable.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 Owner/Contractor Agreement.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Make applications for payment on account as provided in Agreement monthly as Work progresses.

.2 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.

.3 Submit to Departmental Representative, at least 14 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment.

1.3 SCHEDULE OF VALUES

.1 Provide schedule of values supported by evidence as Departmental Representative may reasonably direct and when accepted by Departmental Representative, be used as basis for applications for payment.

.2 Include statement based on schedule of values with each application for payment.

.3 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as [Departmental Representative] may reasonably require to establish value and delivery of products.

1.4 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS

.1 Submit separate schedule of unit price items of Work requested in Bid form.

.2 Make form of submittal parallel to Schedule of Values, with each line item identified same as line item in Schedule of Values. Include in unit prices only:

.1 Cost of material.

.2 Delivery and unloading at site.

.3 Sales taxes.

.4 Installation, overhead and profit.

.3 Ensure unit prices multiplied by quantities given equal material cost of that item in Schedule of Values.

1.5 PROGRESS PAYMENT

.1 Departmental Representative will issue to Owner, no later than 10 days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Departmental Representative determines to be due. If Departmental

Representative amends application, Departmental Representative will give notification in writing giving reasons for amendment.

1.6 SUBSTANTIAL PERFORMANCE OF WORK

.1 Prepare and submit to Departmental Representative comprehensive list of items to be completed or corrected and apply for a review by Departmental Representative to establish Substantial Performance or Interim Completion of Work or substantial performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion which Owner agrees to accept separately is substantially performed. Failure to include items on list does not alter responsibility to complete Contract.

.2 No later than 10 days after receipt of list and application, Departmental Representative will review Work to verify validity of application, and no later than 7 days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.

.3 Departmental Representative give state date of Substantial Performance of Work or designated portion of Work in certificate.

.4 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Departmental Representative, establish reasonable date for finishing Work.

1.7 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

.1 After issuance of certificate of Substantial Performance of Work:

.1 Submit application for payment of holdback amount.

.2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Owner might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.

.2 After receipt of application for payment and sworn statement, Departmental Representative will issue certificate for payment of holdback amount.

.3 Where holdback amount has not been placed in a separate holdback account, Owner shall, 10 days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of Owner and Contractor.

.4 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Where lien legislation does not exist or apply, holdback amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties. Owner may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable to Place of

Work, other third party monetary claims against Contractor which are enforceable against Owner.

1.8 PROGRESSIVE RELEASE OF HOLDBACK

.1 Where legislation permits, if Departmental Representative has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Owner shall pay holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.

.2 In addition to provisions of preceding paragraph, and certificate wording, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.9 FINAL PAYMENT

.1 Submit application for final payment when Work is completed.

.2 Departmental Representative will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Departmental Representative will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.

.3 Departmental Representative will issue final certificate for payment when application for final payment is found valid.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction work week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project planning, monitoring and control system: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately ten (10) working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to Departmental Representative within ten (10) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within five (5) working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

.1 Excavation, filling and road structure near the building (Block B) will be complete within twenty (20) working days after the Award of Contract date.

.2 Infrastructure will be complete within twenty (20) working days after the Award of Contract date at the latest.

.3 Work related to the water intake will be complete within thirty-five (35) working days of Award of Contract date (if in the fall of 2016) or before July 1st 2017 if the General Contractor prefers to execute the work during the spring of 2017..

.4 Access for the cleaning of the aqueduct pipes will be complete within twenty-five (25) working days of Award of Contract date.

.5 Interior finishing and fitting, as well as mechanical, and electrical work, will be complete within twenty (20) working days of Award of Contract date (this includes equipment delivery delays). However, the execution of the work at the construction site will be carried out within fourteen (14) weeks.

.6 Interim Certificate (Substantial Completion) will be delivered within twenty (22) weeks of Award of Contract date if the work related to the water intake is executed in 2016 and within twenty-four (24) weeks of Award of Contract date if the work related to the water intake is executed in 2017. The twenty-two (22) and twenty-four (24) week deadlines do not take into account equipment delivery delays or if the work related to the water intake is executed in 2017.

.2 When preparing the work schedule, the Contractor will take the delays required to obtain some pieces of equipment, mainly pumps, into consideration. The said equipment will be ordered as soon as the contract is awarded.

.3 The Contractor will plan the work in such a way as to avoid service interruptions at the filtered water pumping facilities. He may perform work in the wet well before the delivery of the pumps in order to avoid delays regarding the work.

1.5 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 The Departmental Representative will review and return revised schedules within five (5) working days.

.3 Revise impractical schedule and resubmit within five (5) working days.

.4 Accepted revised schedule will become the Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

.1 Awarding of the contract.
.2 Shop Drawings, Samples.
.3 Permits.
.4 Mobilization.
.5 Excavation.
.6 Backfill.
.7 Water intake.
.8 Access for pipe cleaning.
.9 Raw water mechanical components.
.10 Modifications to the raw, filtered and fresh water pipes.
.11 Interior architecture (walls, floors and ceiling).
.12 Plumbing.
.13 Modification to the mechanical components for filtered water (wet well).
.14 Modification to the mechanical components for filtered water (dry well)
.15 Electricity.
.16 Piping.
.17 Structure.
.18 Controls/regulation.
.19 Heating, Ventilating, and Air Conditioning.
.20 Testing and Commissioning.
.21 Supplied equipment long delivery items.

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule once a week so that it reflects activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE CONSIDERATIONS

.1 Required documents and samples will be submitted for approval to the Departmental Representative as soon as possible and in accordance with a predetermined order established in order not to delay the execution of the work. Submittal delays will not constitute grounds to extend the work schedule and such requests will be denied.

.2 Work requiring the submittal of documents and samples will not begin before the verification of all submitted documents and samples is complete.

.3 The characteristics indicated on shop drawings, technical data sheets and product and work samples will be expressed in metric units.

.4 If the items are not produced or manufactured in metric units or if the characteristics of the items are not in SI units, converted values may be accepted.

.5 Documents and samples will be verified before they are submitted to the Departmental Representative. Through this verification, the General Contractor will confirm that the requirements pertaining to the work were or will be determined and verified, and that all of the documents and samples submitted were examined and found to be in accordance with the requirements of the work and the contractual documents. Documents and sample without stamps, signatures, dates and identification related to a given project will be returned without review and considered rejected.

.6 When submitting documents and sample, the Departmental Representative will be notified in writing of any differences between the documents and/or samples and the contractual documents and the motivations behind said differences will be explained.

.7 The accuracy of the measurements taken on site *versus* the adjacent structures affected by the work will be verified.

.8 The fact that the submitted documents and samples will be reviewed by the Departmental Representative does not relieve the General Contractor from his responsibility to provide complete and accurate documents.

.9 A verified copy of each submitted document will be available at the construction site.

.10 Electronic documents are preferred (PDF format). However, the Departmental Representative may accept or request hard copies. Four (4) hard copies will be provided.

1.2 SHOP DRAWINGS AND TECHNICAL DATA SHEETS

.1 “Shop drawings” refer to drawings, diagrams, illustrations, tables, performance or productivity graphs, leaflets and other documents required from the General Contractor to show specific details of the structure to be built.

.2 Shop drawings will indicate the materials to be used, as well as the construction and anchoring methods. They will also include assembly diagrams, connection details, relevant explanatory notes and any other information required for the execution of the work. When structures or elements are linked or connected to other structures or elements, the shop

drawings will indicate that the prescriptions were coordinated, regardless of the section to which the other adjacent structures or elements will be supplied and installed. Refer to the design specifications and drawings.

.3 The Departmental Representative will have ten (10) business days to review each batch of submitted documents.

.4 The contract price should not change as a result of the modifications made to the shop drawings by the Departmental Representative. If this is the case, the Departmental Representative will be notified in writing before work begins.

.5 The shop drawings will be modified as requested by the Departmental Representative in accordance with the requirements of the contractual documents. When submitting the shop drawings again, the Departmental Representative will be notified in writing of modifications in addition to those requested.

.6 Two (2) copies of a transmission letter containing the information listed below will be enclosed with the submitted documents:

- .1 The date.
- .2 The project's name and number.
- .3 The name and address of the General Contractor.
- .4 The title of each drawing, technical data sheet and sample, as well as the number of copies submitted;
- .5 Any other relevant information.

.7 The submitted documents will show the following:

- .1 The date of preparation and revision;
- .2 The project's name and number.
- .3 The name and address of the following:
  - .1 Sub-contractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 The General Contractor's stamp, signed by his authorized representative, will thus certify that the submitted documents have been approved, that the measurements taken on site have been verified and that everything is in accordance with the contractual documents.
- .5 Relevant details pertaining to the specific work involved:
  - .1 Materials and manufacturing details;
  - .2 The arrangement or configuration with dimensions (including the measurements taken on site), as well as allowances and clearances;
  - .3 Details pertaining to assembly or fine-tuning;
  - .4 Characteristics such as power, flow or capacity.
  - .5 Performance characteristics.
  - .6 Reference standards.
  - .7 Operational weight.

.8 Wiring diagrams;

.9 Single-line diagram and flow diagram.

.10 Connections with adjacent structures.

.8 Once the shop drawings and technical data sheets have been verified by the Departmental Representative, copies are to be distributed.

.9 Three (3) hard copies or one (1) electronic copy of the shop drawings required in the sections of the specifications and in accordance with reasonable requirements from the Departmental Representative will be submitted.

.10 If shop drawings are not required due to the use of a standard product, submit tree (3) hard copies or one (1) electronic copy of the manufacturer's documents in accordance with the prescriptions of the technical specifications and the requirements of the Departmental Representative.

.11 Three (3) hard copies or one (1) electronic copy of the test reports as prescribed in the technical specifications and required by the Departmental Representative will be submitted.

.1 The report signed by the official representative of the testing laboratory will certify that materials, products or systems identical to those proposed for the project were tested in accordance with the prescribed requirements.

.2 The test will have been carried out within the last three (3) years preceding the date of the awarding of the contract.

.12 Three (3) hard copies or one (1) electronic copy of the certificates required in the technical specifications and required by the Departmental Representative will be submitted.

.1 The documents, which will be printed on the manufacturer's official stationery and signed by its official representative, will certify that the products, material and systems provided comply with the prescriptions of the specifications.

.2 The certificates will be dated after the awarding of the contract and include the title of the project.

.13 Three (3) hard copies or one (1) electronic copy of the manufacturer's instructions as prescribed in the technical specifications and required by the Departmental Representative will be submitted.

.1 Preprinted documents describing the installation method for the product, materials and systems, including specific notes and material safety data sheets indicating impedance, risks and the safety measures to be implemented.

.14 Three (3) hard copies or one (1) electronic copy of the report on the controls carried out on site by the manufacturer as prescribed in the technical specifications and required by the Departmental Representative will be submitted.

.1 Reports on the testing and verifications made by the manufacturer in order to confirm the conformity of the products, materials or systems installed as per the manufacturer's instructions.

.15 Three (3) hard copies and one (1) electronic copy of operation and maintenance sheets as prescribed in the technical specifications and required by the Departmental Representative will be submitted.

.16 Information that is not relevant to the work will be removed.

.17 In addition to the usual information, provide any additional details applicable to the work.

.18 After verification by the Departmental Representative, if no error or omission has been found in the shop drawings or if they only include minor corrections, a printout will be returned and installation may then begin. If the shop drawings have been rejected, the annotated copies will be returned and corrected shop drawings will have to be submitted again as per the indications mentioned above before installation begins.

.19 The review of shop drawings by the Departmental Representative only aims at verifying the conformity of the information against the general concept.

.1 This review does not mean that the Client approves the detailed design shown in the shop drawing. This is under the responsibility of the General Contractor who submitted the shop drawings. It does not relieve the General Contractor from the obligation to provide comprehensive and accurate drawings and to comply with all of the requirements of the contractual documents and work.

.2 Without restricting the general scope of the information above, it is important to specify that the General Contractor is responsible for the accuracy of the dimensions confirmed on site, the provision of information on the installation or construction methods and the coordination of the work performed by all of the various trades.

1.3 PRODUCT SAMPLES

.1 Two (2) product samples will be submitted for examination purposes as prescribed in the technical specifications. The samples will be tagged and the tags will indicate the origin and expected destination.

.2 The samples will be mailed postage prepaid to the Departmental Representative's business office.

.3 The Departmental Representative will be notified in writing of the differences between the samples and the requirements of the contractual documents at the time the samples will be presented.

.4 If colour, pattern or texture is specified, the entire range of samples necessary will be submitted.

.5 The contract price should not change as a result of the modifications made to the samples by the Departmental Representative. If this is the case, the Departmental Representative will be notified in writing before work begins.

.6 The samples will be modified as requested by the Departmental Representative in accordance with the requirements of the contractual documents.

.7 The reviewed and approved samples will become the reference based on which the quality of the materials and finished structures will be assessed.

1.4 SAMPLE OF THE STRUCTURE

.1 Samples of the structure required in section 01 45 00 “Quality Control" will be taken.

1.5 CERTIFICATE AND MEETING MINUTES

.1 The documents required by the “Commission des normes, de l’équité, de la santé et de la sécurité au travail” or CNESST will be submitted immediately after the awarding of the contract.

Part 2 Products

2.1 NOT APPLICABLE

.1 Not applicable.

Part 3 Execution

3.1 NOT APPLICABLE

.1 Not applicable.

END OF SECTION

Partie 1 General

1.1 REFERENCES

.1 Province of Québec

.1 Act Respecting Occupational Health and Safety, L.R.Q., c. S-2.1.

.2 Safety Code for the Construction Industry, L.R.Q., c. S-2.1, r.4.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to Departmental representative the site-specific prevention program, as outlined in the article “GENERAL REQUIREMENTS”, at least 10 days prior to the start of work.

.3 Departmental representative will review Contractor’s site-specific prevention program and provide comments to Contractor within 10 days after receipt of the document. Revise plan as appropriate and resubmit to Departmental representative within 5 days after receipt of comments from Departmental representative. Departmental representative reserves the right not to authorize the start of work on the construction site as long as the content of the prevention program is not satisfactory. The Contactor shall then update his prevention program and resubmit it to the Departmental representative if the scope of work changes or if the working methods of the Contractor differ from his initial plans or for any other applicable new condition.

.4 Departmental representative’s review of Contractor’s site-specific prevention program should not be construed as approval of the program and does not reduce the Contractor’s overall responsibility for construction Health and Safety during the work.

.5 Submit copies of Contractor’s authorized representative’s construction site health and safety inspection reports to Departmental representative once a week.

.6 Submit to Departmental representative within 24 hours a copy of any inspection report, correction notice or recommendation issued by Federal, Provincial and Territorial health and safety inspectors.

.7 Submit to Departmental representative within 24 hours an investigation report for any accident involving injury and any incident exposing a potential hazard.

The investigation report shall contain at least the following:

1. Date, time and place of accident;
2. Name of sub-contractor involved in the accident;
3. Number of persons involved and condition of wounded;
4. Witness identification;
5. Detailed description of tasks performed at the time of the accident;
6. Equipment being used to accomplish the tasks performed at the time of the accident;
7. Corrective measures taken immediately after the accident;

8. Causes of the accident;

9. Preventive measures that have been put in place to prevent a similar accident.

.8 Submit to Departmental representative WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 – Submittals. Contractor must also keep one copy of these documents on the construction site.

.9 Medical surveillance: where prescribed by legislation, regulation or prevention program, submit certification of medical surveillance for construction site personnel prior to commencement of Work, and submit additional certifications for any new construction site personnel to Departmental representative.

.10 Submit to Departmental representative an on-site Emergency Response Plan at the same time as the prevention program. The Emergency Response plan must contain the elements listed in the article "GENERAL REQUIREMENTS" of this section.

.11 Submit to Departmental representative copies of all training certificates required for the application of the prevention program, in particular (if applicable) for the following:

.1 First aid in the workplace and cardiopulmonary resuscitation;

.2 Work likely to release asbestos dust (mandatory for all work where asbestos is present);

.3 Work in confined spaces (mandatory for all work in confined spaces);

.4 Lockout-tagout procedures (mandatory for all work requiring lockout);

.5 Safely operating forklift trucks (mandatory for all forklift usage);

.6 Safely operating elevating work platforms (mandatory for the use of all elevating platforms);

.7 Any other requirement of Regulations or the safety program.

In addition, the certifications of the *Cours de santé et sécurité générale pour les chantiers de construction* (General Health and Safety Training for Construction Sites) will be available on demand on the construction site.

.12 Engineer's plans and certificates of compliance: Contractor must submit to the Departmental representative and to the *Commission des normes, de l'équité, de la santé et de la sécurité du travail* (CNESST) a copy signed and sealed by engineer of all plans and certificates of compliance required pursuant to the *Safety Code for the Construction Industry* (S-2.1, r.4) or by any other legislation or regulation or by any other clause in the specifications or in the contract. The Contractor must also submit a certificate of conformity signed by an engineer once the facility for which these plans were prepared has been completed and before a person uses the facility. A copy of these documents must be available on site at all times.

1.3 FILING OF NOTICE OF CONSTRUCTION SITE OPENING

.1 Notice of construction site opening shall be submitted to the CNESST before work begins. A copy of such notice and acknowledgment of receipt from the CNESST shall be submitted to Departmental representative.

At the completion of all the work, a notice of construction site closing shall be submitted to the CNESST, with a copy to Departmental representative.

.2 The Contractor shall assume the role of being the Principal Contractor in the limits of the construction site and elsewhere where he must execute work within the framework of this project. The Contractor shall recognize the responsibility of being the Principal Contractor of the project and identify himself as such in the notice of the construction site opening he provides to the CNESST.

.3 The Contractor will accept to divide and identify the construction site adequately in order to define time and space at all times throughout the course of the project.

1.4 HAZARD ASSESSMENT

.1 The contractor must perform construction site specific safety hazard assessment related to the project.

1.5 SITE CONDITIONS AND EXECUTION OF THE WORK

.1 Personnel called upon to perform work at the construction site will be exposed to the following:

.1 Strike-slips faults;

.2 The usual risks associated with a construction site;

.3 Risks associated with the tide.

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental representative prior to commencement of Work.

.2 Contractor's representative with decision power must attend any meetings at which construction site safety and health issues are to be discussed.

.3 If it is anticipated that there will be 25 workers or more on the construction site at any given time, the Contractor shall set up a worksite committee and hold meetings as required by the *Safety Code for the Construction Industry* (S-2.1, r. 4). A copy of the minutes of the meetings of the committee shall be provided to the Departmental representative no later than 5 days after the committee meeting.

1.7 REGULATORY REQUIREMENTS

.1 Comply with all legislation, regulations and standards applicable to the construction site and its related activities.

.2 Comply with specified standards and regulations to ensure safe operations on a site containing hazardous or toxic materials.

.3 Always use the most recent version of the standards specified in the *Safety Code for the Construction Industry* (S-2.1, r.4), notwithstanding the date indicated in that *Code*.

1.8 COMPLIANCE REQUIREMENTS

.1 Comply with the *Act Respecting Occupational Health and Safety* (L.R.Q., c. S-2.1) and the *Safety Code for the Construction Industry* (S-2.1, r. 4.) in addition to respecting all the requirements of this specification manual.

1.9 RESPONSIBILITIES

.1 The Contractor must acknowledge and assume all the tasks and obligations which customarily devolve upon a principal Contractor under the terms of the *Act Respecting Occupational Health and Safety* (L.R.Q., ch. S-2.1) and the *Safety code for the construction industry* (S-2.1, r.4).

.2 The Contractor must be responsible for health and safety of persons on construction site, safety of property on construction site and for the protection of persons adjacent to construction site and the environment to the extent that they may be affected by conduct of the work.

.3 No matter the size or location of the construction site, the Contractor must clearly define the limits of the construction site by physical means and respect all specific regulation requirements applicable in this regard. The means chosen to define the limits of the construction site must be submitted to the Departmental representative.

.4 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific prevention Plan.

1.10 WORK PERFORMED BY EXTERNAL CONTRACTORS

.1 On this construction site, it is anticipated that work will be performed by an external contractor that has not been hired by the Contractor, responsible for cathodic protection:

.2 The Contractor must take the necessary steps to protect the health and safety of external contractors that have no contractual link with the Contractor but have been mandated by the Departmental representative to perform certain work. In return, these external contractors are obligated to submit to the authority of the Contractor (Principal Contractor). A subordination agreement must be signed by the Contractor and by each external contractor to this effect and submitted to the Departmental representative prior to the start of the work of each contractor (see the wording in the article HEALTH AND SAFETY SUBORDINATION AGREEMENT)

1.11 GENERAL REQUIREMENTS

.1 Before undertaking the work, prepare a site-specific prevention program based on the hazards identified according to the article “HAZARD ASSESSMENT” and the article “RISKS INHERENT TO THE WORKSITE” in this section. Apply this program in its totality from the start of the project until demobilization of all personnel from the construction site. The prevention program shall take into consideration the specific characteristics of the project and cover all the work to be executed on the construction site.

The safety program must include at least the following:

.1 Company safety and health policy;

.2 Description of the stages of the work;

.3 Total costs, schedule and projected workforce curves;

.4 Flow chart of safety and health responsibilities;

.5 Physical and material layout of the construction site;

.6 Risk assessment for each stage of the work, including preventive measures and the procedures for applying them;

.7 Identification of the preventive measures relative to the specific risks inherent to the worksite indicated in the article “RISKS INHERENT TO THE WORKSITE”;

.8 Identification of preventive measures for health and safety of employees and / or public works site as indicated in the article “SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND PUBLIC”;

.9 Training requirements;

.10 Procedures in case of accident/injury;

.11 Written commitment from all parties to comply with the safety program;

.12 Construction site inspection cheklist based on the preventive measures;

.13 Eemergency response plan which shall contain at least the following:

.1 Construction site evacuation procedures;

.2 Identification of resources (police, firefighters, ambulance services, etc.);

.3 Identification of persons in charge of the construction site;

.4 Identification of the first-aid attendants;

.5 Communication organizational chart (including the person responsible for the site and the Departmental representative);

.6 Training required for those responsible for applying the plan;

.7 Any other information needed, in the light of the construction site’s characteristics.

If available, the Departmental representative will provide the evacuation procedures to the Contractor who shall then coordinate the construction site procedure with that of the site and submit it to the Departmental representative.

.2 Departmental representative may respond in writing, where deficiencies or concerns are noted in the prevention program and may request resubmission with correction of deficiencies or concerns.

.3 In addition to the prevention program, during the course of the work the Contractor shall elaborate and submit to the Departmental representative specific written procedures for any work having a high risk factor of accident (for example: demolition procedures, specific installation procedures, hoisting plan, procedures for entering a confined space, procedures for interrupting electric power, etc.) or at the request of the Departmental representative.

.4 The Contractor shall plan and organize work so as to eliminate the danger at source or ensure collective protection, thereby minimizing the use of personal protective equipment.

.5 Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.

.6 All mechanical equipment (for example, but not limited to: hoisting devices for persons or materials, excavators, concrete pumps, concrete saws) shall be inspected before delivery to the construction site. Before using any mechanical equipment, the Contractor

shall obtain a certificate of compliance signed by a qualified mechanic dated less than a week prior to the arrival of each piece of equipment on the construction site; the certificate shall remain on the construction site and transmitted to the Departmental representative on demand.

.7 Ensure all inspections (daily, periodic, annual, etc.) for the hoisting devices for persons or materials required by the current standards are carried out and be able to provide a copy of the inspection certificates to the Departmental representative on demand.

.8 The Departmental representative can at all times, if he suspects a malfunction or the risk of an accident, order the immediate stop of any piece of equipment and require an inspection by a specialist of his choice.

.9 The Departmental representative must be consulted for the location of storing gas cylinders and tanks on the construction site.

1.12 RISKS INHERENT TO THE WORKSITE

.1 In addition to the risks related to the tasks to be carried out, personnel responsible for the execution of the work on the construction site will be exposed to the following risks, inherent to the area where the work will be executed.

.1 Materials containing lead;

.2 Moulds at the pumping facilities;

.3 Overhead power lines;

.4 Underground utilities and sewers near connections to the aqueduct;

.5 Traffic near the access ramp to the river;

.6 Presence of personnel from the Institut Maurice-Lamontagne;

.7 Water body (river) affected by tides;

.8 Work in stairways and at height;

.9 Work in confined spaces;

.10 Diving work in the wet well;

.11 Work in various tide conditions at the water intake.

.2 The Contractor will make his own risk assessment in order to validate the actual risks at the site. He will also include all of the risks identified in his prevention program.

1.13 UNFORESEEN HAZARDS

.1 Whenever a source of danger not defined in the specifications or identified in the preliminary construction site inspection arises as a result of or in the course of the work, the Contractor must immediately suspend work, notify the person responsible for health and safety on the construction site, take appropriate temporary measures to protect the workers and the public and notify Departmental representative, both verbally and in writing. Then the Contractor must do the necessary modifications to the prevention program or apply the security measures required in order to resume work.

1.14 PERSON IN CHARGE OF HEALTH AND SAFETY

.1 The Contractor will hire a competent person authorized as a safety officer. This person’s tasks will:

.1 Have site-related working experience specific to the activities associated with the present project;

.2 Have working knowledge of occupational health and safety regulations in the workplace;

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter the construction site to perform work;

.4 Be responsible for implementing, enforcing in detail and monitoring site-specific Contractor's Health and prevention program;

.5 Be at the construction site at all times during execution of work, report directly to the site supervisor and act according to his instructions;

1.15 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on construction site in accordance with Acts and Regulations of the Province, and in consultation with Departmental representative.

.2 At a minimum, the following information and documents must be posted in a location readily accessible to all workers:

.1 Notice of construction site opening;

.2 Identification of principal Contractor;

.3 Company OSH policy;

.4 Site-specific prevention program;

.5 Emergency plan;

.6 Minutes of worksite committee meetings;

.7 Names of worksite committee representatives;

.8 Names of the first-aid attendants;

.9 Action reports and correction notices issued by the CNESST.

1.16 INSPECTION OF THE CONSTRUCTION SITE AND CORRECTION OF NON-COMPLIANCES

.1 Inspect the construction site and complete the construction site inspection checklist and submit it to the Departmental representative in accordance with the article "ACTION AND INFORMATIONAL SUBMITTALS" in this section.

.2 Immediately take all necessary measures to correct any situations deemed non-compliant during the inspections mentioned in the previous paragraph or noticed by the authorities having jurisdiction or the Departmental representative or his agent.

.3 Submit to Departmental representative written confirmation of all measures taken to correct the situation in case of non-compliance in matters pertaining to health and safety.

.4 The Contractor will give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order cessation and resuming of work as and when deemed necessary or desirable in the interests of safety and health. This person should always act so that the safety and health of the public and

construction site workers and environmental protection take precedence over cost and scheduling considerations.

.5 The Departmental representative or his agent may order cessation of work if the Contractor does not make the corrections needed to conditions deemed non-compliant in matters pertaining to health and safety. Without limiting the scope of the preceding articles, the Departmental representative may order cessation of work if, in his view, there is any hazard or threat to the safety or health of construction site personnel or the public or to the environment.

1.17 BLASTING

.1 Blasting and the use of any explosive devices is not permitted in the context of this project.

1.18 ELECTRICAL WORK

.1 Contractor shall ensure that all electrical work is executed by qualified employees in accordance with the provincial regulation respecting vocational training and qualification.

.2 Contractor shall respect all requirements of standard CSA Z462 *Workplace Electrical Safety Standard*.

.3 No repairs or alterations shall be carried out on any live equipment except where complete disconnection of the equipment is not feasible.

.4 Contractor shall respect all requirements prescribed in paragraph “LOCKOUT-TAGOUT” in this section.

.5 Contractor shall advise in writing the Departmental representative of all the work that cannot be done with de-energized equipment and obtain his authorization. Contractor shall demonstrate to the Departmental representative that it is impossible to do the work with de-energized equipment and provide all the information necessary to request and obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) before the beginning of the work, excluding for the exceptions indicated in standard CSA Z462 Workplace electrical safety.

.6 The energized electrical work permit on must contain at least the following elements:

- Description of the circuit and equipment and its location;
- Justification for having to do the work in an energized condition;
- Description of safe work practices to apply;
- Results of the shock hazard analysis;
- Limit of the protective perimeter against electric shocks;
- Results of the arc flash hazard analysis;
- Description of the arc flash protection boundary;
- Description of the personal protective equipment required;
- Description of the means to limit access to unqualified persons;

- Proof that an information session has been carried out;
- Approval signature of the energized electrical work (by a person in authority or by the owner).

.7 If for the operational requirements of the occupants of the site the representative of the site requires that the Contractor performs work in an energized condition, the Contractor shall obtain all the information required to request and obtain obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) and have it signed by the representative of the site assigned by the Departmental representative before the beginning of the work.

1.19 FUNGAL CONTAMINATION

.1 It is not anticipated that the work covered by the present specifications involves the manipulation of materials contaminated by mould; however, if the Contractor or the Departmental representative or his agent discover materials which are susceptible of being contaminated by mould, the Contractor must immediately stop the work and advise the Departmental representative. If more investigation demonstrates that the materials do contain mould, the Contractor shall comply with the following requirements.

.2 Prior to starting any work where workers are likely to be in contact with materials contaminated by mould, the Contractor must:

.1 Provide a written procedure for the work which respects all the requirements of the *Safety code for the construction industry* S-2.1, r- 4, as well as the requirements indicated in the document “Mould Guidelines for the Canadian Construction Industry” published by the Canadian Construction Association (http://www.cca-acc.com/documents/electronic/cca82/cca82.pdf).

.2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

1.20 EXPOSURE TO SILICA

.1 For any interior or exterior work generating silica, the Contractor must respect the following requirements, in addition to those in the *Safety code for the construction industry* S-2.1, r.4.

.1 Work in wet environment or use tools with the inflow of water in order to reduce dustiness, if not, collect dust at the source and retain it with a high-efficiency filters not to propagate dust in the environment.

.2 Clean surfaces and tools with water, never with compressed air.

.3 Sand and pickle surfaces by using an abrasive containing less than 1% of silica (also called amorphous silica).

.4 Install shields or other containment device to prevent silica dust from migrating toward other workers or the public.

.5 Wear individual respiratory and ocular protection equipment during all the operations that could generate silica dust in accordance with the requirements of the *Safety Code for the Construction Industry*, S-2.1, r.4 ().

.6 Wear coveralls to prevent contamination outside the construction site.

.7 Do not eat, drink, or smoke in a dusty environment.

.8 Wash the hands and the face before drinking, eating or smoking.

1.21 LEAD-BASE PAINT REMOVAL

.1 Prior to all work where workers are likely to handle materials containing lead-base paint or other substances containing lead, the Contractor must:

.1 Provide a written procedure for the work which respects all the requirements of the *Safety Code for the Construction Industry* S-2.1, r- 4, as well as the requirements indicated in the document "*Guideline for Lead on Construction Projects*" published by the Ontario Ministry of Labour (http://www.labour.gov.on.ca/english/hs/pdf/gl_lead.pdf). If there is a discrepancy between the Québec regulation and the Ontario document, the most stringent requirement shall apply.

.2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

1.22 RESPIRATORORY PROTECTION

.1 Contractor must ensure that all workers who must wear a respirator as part of their duties have received training for that purpose as well as fit testing of their respirator, in accordance with CSA Standard Z94.4 *Selection, use and care of respirators*. Submit the certificates of the fit testings to the Departmental representative on demand.

1.23 FALL PROTECTION

.1 Plan and organize work so as to eliminate the risk of fall at the source or ensure collective protection, thereby minimizing the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness that complies with CSA standard CAN/CSA Z-259.10 M90. A safety belt must not be used as fall protection.

1.24 CONFINED SPACES

.1 In addition to the requirements of the provincial regulation applicable to confined spaces, the Contractor must respect the requirements in the following paragraphs.

.2 The Departmental representative reserves the right, depending on the nature of the risk of the confined spaces, of the work to be done and/or of the level of competence in confined spaces demonstrated by the Contractor, to require from the latter that he use the services of a firm specialized in health and safety or in confined space work to perform the analysis of the risks inherent to the confined spaces, to complete the entry permit, to conduct surveillance of the work or for any other task related to the work in confined spaces.

Information on confined spaces existing on the construction site

1. The following presents a non-exclusive list of the confined spaces that the Contractor will likely have to access during this project:

List of confined spaces

2. The Contractor shall take into consideration each of these confined spaceS and must also add to this list the confined spaces that he is likely to build/install during this project.

Person in charge of the health and safety for the work in confined spaces

1. The Contractor shall designate a person to be in charge of the health and safety for the work in confined spaces. This person shall be qualified, as defined in the article 297 of the Regulation Respecting Occupational Health and Safety (S-2.1, r.13). This person must be present at all times during work in confined spaces and must make sure that all the requirements of the regulation and the ones specified in this section are respected. This person must amongst other things fill out and issue the entry permit for the confined spaces.

Training

1. All persons having access to a confined space, including the person in charge and the watcher of the confined space shall have completed training on entry in confined spaces.
2. All persons who have to use supplied-air respirator to access the confined spaces shall have completed training on the use of these apparatus.
3. All persons identified as rescuers for confined spaces shall have completed training on confined spaces rescue.
4. Each training required in the preceding paragraphs must be provided by a firm specialized in health and safety or in confined spaces.
5. The training certificates of the persons mentioned above must be submitted to the Departmental representative before the beginning of the work in confined spaces.

Risk assessment of confined spaces

1. For each of the confined spaces listed at the beginning of this article, the Contractor must obtain the necessary information from the site representative and proceed to the assessment of the risk inherent to each confined space and relative to:
   a. The prevailing internal atmosphere, namely the concentration of oxygen, inflammable gases and vapours, combustible or explosive dusts as well as the categories of contaminants likely to be present in this enclosed area or nearby;
   b. The fact that the natural or mechanical ventilation is insufficient
   c. The materials that are present there and that can cause the worker to sink, to be buried or to drown, such as sand, grain or a liquid;
   d. The interior configuration;
   e. Pipes and conduits penetrating the confined space;
   f. Energies such as electricity, moving mechanical parts, heat stress, noise and hydraulic energy;
   g. Ignition sources such as open flames, lighting, welding and cutting, static electricity or sparks;
   h. All other particular circumstances, such as the presence of vermin, rodents or insects.
2. These risk assessments must be done by the person in charge of the health and safety of the work in confined spaces. They must be submitted to the Departmental representative for analysis at least 10 days before the proposed date for the work in confined spaces and they must also include the following information:
   a. Location of the confined space;
   b. Description of the confined space;

c. Dimensions of the confined space;
d. Number, location and dimension**S** of the openings;
e. Content of the confined space (material, substances, etc.)
f. Date of the assessment;
g. Name and signature of the person who conducted the assessment and the name of his employer.

3. The Contractor must repeat the same process for each of the confined spaces that he will build/install during this project.

Confined spaces entry permits

1. At least 5 days before the scheduled date for the work in a confined space the Contractor must submit for analysis to the Departmental representative a copy of each entry permit specific to the confined spaces where he must access. The entry permits must be completed by the person in charge of the health and safety of the work in confined spaces, and must contain the following information as a minimum:

.1 Description of the work that will be carried out and the method of work, including the materials and tools needed to do this work;

.2 Description of the risks and corresponding preventive measures according to the risk assessment inherent to the confined space done previously and according to the work to be carried out;

.3 Safety equipment that will be used to control the risks of confined spaces (e.g.: fan, gas detectors, local exhaust ventilation, personal protective equipment, etc.);

.4 Rescue procedure covering at least the following:
a. Means of communication between the supervisor of the confined space and the workers in the confined space;
b. Lifesaving equipment specific to each confined space;
c. Confirmation that the municipal emergency response service has been advised that work in confined spaces would be going on at this specific construction site and that they may intervene do to a confined space rescue; otherwise, the Contractor must identify the workers on the construction site that will act as rescuers in a confined space in the case where such rescuers must enter the confined space (rescue training is mandatory);
d. Location of telephone and phone number of the municipal emergency response service (if applicable);
e. Date of entry permit;
f. Name of person who issued the permit and the name of his employer;
g. Name of the confined space safety watcher and the name of his employer;
h. Name of the workers who must enter the confined space and the name of each one’s employer.

.5 In cases where the site representative requires the use of a confined space entry permit specific to his site, the Contractor must comply with the requirements of that permit.

Medical surveillance

1. The Contractor must submit to the Departmental representative a medical certificate dated in the last two years for all persons who must use a supplied-air respirator. The certificate must confirm the ability of each person to use this type of apparel.

2. It is recommended that the persons who have to work in sewer collection systems or other similar systems be vaccinated against diphtheria, tetanus and hepatitis “B”.

Requirements while working in confined spaces

1. Before each entry into a confined space, the person in charge of the health and safety for the work in confined spaces shall take readings of oxygen concentration, flammable gases and all toxic gases likely to be present and record these readings on the entry permit required earlier.

2. No worker can access the confined space if the following requirements are not respected:

    1. The concentration of oxygen shall be greater than or equal to 19.5% and less than or equal to 23%;
    2. The concentration of inflammable gases or vapours shall be less than or equal to 10% of the lower explosion limit;
    3. The concentration of other gases must not exceed the standards prescribed in annex I of the Regulation Respecting Occupational Health and Safety (S-2.1, r.13).

.3 If the oxygen and gas concentrations measured respect the regulatory values, the person in charge of the health and safety for the work in confined spaces must ensure that all preventive measures indicated on the permit are in place and then must complete the entry permit (date, time, signatures, etc.) before issuing the permit and allow entry into the confined space.

.4 A permit is only valid for one work shift; the Contractor must submit a new permit for each extra shift.

.5 During the work inside the confined space, the gas concentration must be measured continuously and the gas detector must be installed at ~~the level of the~~ breathing area of the workers. If the conditions inside the confined space are such that the workers might not hear/see the detector’s alarm, the Contractor must find a way for the confined space safety watcher to watch the concentration measures while maintaining the measurements at the level of the breathing zone of the workers.

.6 If the work is organized in a way that the workers are scattered far away from each other in a large confined space, the Contractor needs to provide additional gas detectors.

.7 The Contractor must provide the gas detectors and maintain them in good condition. He must be able to show that the gas detectors used have been calibrated and adjusted by the person in charge of the health and safety for the work in confined spaces or by a qualified person, in accordance with the manufacturer’s recommendations. The Departmental representative can at all times have the accuracy of the measuring devices checked. In the event of the failure of a detection device, the work must be stopped immediately and all workers must leave the confined space.

.8 The manufacturer’s manual of the gas detectors must be available on the construction site.

.9 The Contractor shall provide a ventilation system to keep concentrations of contaminants below the regulatory limits.

.10 If work generating contaminants are performed (welding, use of products, etc.), the Contractor must, if needed, install an aspiration system for the contaminants so that the regulatory values of air quality can be maintained at all times.

.11 If a detecting device alarm goes off, all workers shall leave the confined space. The measured levels of concentration must then be recorded on the entry permit. The Contractor shall then find the source of contamination, neutralize it, ventilate the confined space to eliminate contaminant residues and authorize access to the confined space only when concentrations of oxygen and gas have returned to normal.

.12 Compressed gas cylinders or welding equipment shall not be brought into confined spaces: this equipment shall remain outside and shall not block entrances or exits; all cylinders shall be properly secured.

.13 Tools and electrical devices used to work in the confined spaces shall be grounded and, when necessary, designed to be explosion-proof. All equipment must be connected to a ground fault interrupter outlet or to a step-down transformer. The Contractor shall, at his own cost, hire a qualified electrician to adjust power receptacles and/or circuit breakers that he intends to use which do not meet these criteria.

.14 The Contractor shall obtain a Hot Work Permit and respect the requirements to that effect when the work to be carried out includes hot work.

.15 The Contractor must assign a competent person to assume the duties of confined space safety watcher. The supervisor shall be exclusively dedicated to these duties and must constantly remain outside of the confined space as long as there is a worker in it. He must also:

a. Ensure that the entry permit has been filled, signed and posted near the confined space;

b. Be familiar with the work procedure specific to the confined space and ensure that it is respected;

c. Ensure continuous communication with all the workers in the confined space and ensure that all the equipement required in case of emergency is present;

d. Have a good knowledge of the ~~backup~~ ventilation systems and ensure their proper functioning for the duration of the work;

e. Prevent access to unauthorized persons;

f. Ensure that the conditions around the confined space zone is not a health or security risk for the workers inside the confined space;

g. Initiate the emergency procedure if needed.

.16 The same person may act as a confined space safety watcher and as the person in charge of the health and safety of the work in confined spaces, provided all requirements of both functions are met.

1.25 EXCAVATION WORK

.1 In addition to the requirements of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Contractor who performs the digging of trenches or excavations must respect the following requirements:

.1 Fill out the following form and submit it to the Departmental representative before beginning to excavation work.

.2 Submit to the Departmental representative, as appropriate, the following documents:

a. Plans and specifications, signed and sealed by an engineer, of the shoring needed to be installed for the excavation work; or

b. Engineer's advice specifying the wall angles of the trench or excavation.

CSST

Excavation guidelines

N° ____ of ____

This directive is provided as an example by the Commission de la santé et de la sécurité du travail (CSST). It contains the main instructions that the employer should give to the person responsible for the work on the site and to the operator of the earth-moving machine.

Company name	
Project name	Project no.
Address of the site	Construction start date

Field survey

Chaining or axes : from _____ to _____ Attached plan ☐ Plan no. : _____

Working method to use

While making sure the excavation walls do not pose the risk of landslide

- ☐ dig and shore according to the plans and specifications of the engineer ;
- ☐ dig and shore using a trench box ;
- ☐ dig without shoring as long as one of the following conditions is respected:
  - ☐ rock is sound;
  - ☐ no worker goes down in the trench or excavation;
  - ☐ the walls are dug according to the engineer's advice.

Dimensions of excavation (Dig according to the following profile.)

	Minimum	Maximum
H Depth		
Wb Width at bottom		
Width at top		

Safety measures

Deposit the materials at a distance of at least 1.2 metre (4 feet) from top of walls.
Do not allowed any vehicle to come closer than 3 metres (10 feet) from top of walls.

- ☐ Respect the engineer's plan concerning work in the proximity of an existing facility.
- ☐ Follow the location plan to locate the underground infrastructures.
- ☐ Install signaling devices prescribed in the traffic plan (barriers, visual references, etc.).
- ☐ Assign a flag person or more to control the flow of traffic.
- ☐ Respect the procedure prescribes for work near power lines.
- ☐ Provide protection devices for the workers, such as concrete crash barriers.

Name	Occupation	
Signature	Date	Telephone no.

Directive submitted
☐ to the responsible of the work on the site ☐ to the operator of the earth-moving machine

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1.26 WORK NEAR BODIES OF WATER

.1 For all work done near a body of water (such as work above water, work on a wharf, work on the edge of a watercourse, etc.), the Contractor must respect the requirement of the following paragraphs in addition to those in article 2.10.13 du *Code de sécurité pour les travaux de construction* (Safety code for the Construction Industry).

.2 The Contractor must plan his work in a way to implement safety measures to prevent any worker from falling in the water. The use of theses measures should be favoured over the wearing of a life jacket.

.3 Submit the following documents to the Departmental representative before the beginning of the work:

a. Description of the body of water;

b. Description of the work done next to this body of water;

c. Plan of transportation on water adapted to the work and to the characteristics of the body of water;

d. Rescue plan adapted to the work and to the characteristics of the body of water.

Each of the document listed above must contain at a minimum the information required in section 11 of the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry).

If there is the possibility that all or part of the work can be done during the winter, the safety measures included in the documents required above must be adapted accordingly.

.4 The Contractor must submit to the Departmental representative the certificate of training required in article 11.2 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry) for the following individuals:

a. the person assigned to prepare the documents required in the preceding paragraph; and

b. each person responsible for the transport or rescue operations

.5 If the rescue plan stipulates the use of a vessel, the Contractor must submit to Departmental representative the competency card or certificate for the individuals in the rescue team for his work, issued by Transport Canada.

.6 The Contractor must include in his weekly inspection checklist the devices required in the articles 11.4 and 11.5 of the *Safety code for the Construction Industry* (S-2.1, r.4).

.7 Ensure that a rescue vessel moored and in the water is available at each place where a worker may fall in the water. However, a vessel may serve more than one workplace on the same construction site provided the distance between any of these workplaces and the vessel is less than 30 m.

.8 Where the construction site is a wharf, a pier, a quay or any similar structure, a ladder with at least two (2) rungs below the surface of the water shall be installed on the front of the structure every 60 m.

1.27 DIVING OPERATIONS

.1 In accepting this contract, the Contractor agrees to satisfy the following requirements:

.1 Compliance with all the requirements of the *Regulation respecting occupational health and safety* (S-2.1, r.13), more precisely section XXVI. I, entitled *Underwater Work*. Compliance, furthermore, with the latest editions of standards CAN/CSA *Z275.2 - Occupational Safety code for Diving Operations*, CAN/CSA Z275.1 - *Hyperbaric Chambers* and CAN/CSA Z275.4 - *Competency Standard for Diving Operations*. In the event of conflict between these requirements, the most stringent requirement shall apply.

.2 In addition to the above, in cases where construction work is involved, compliance with the *Safety Code for the Construction Industry (S-2.1, r.4)*.

.3 Before starting the work, submit to the Departmental representative the following documents, as per the *Regulation respecting occupational health and safety* (S-2.1, r.13):

a. the professional diving training certificate of each member of the dive team OR a document recognizing the skills of those persons in accordance with the *Competency Standard for Diving Operations*, CAN/CSA Z275.4-02, as per section 312.8 of the Regulation;

b. the workplace first-aid training certificate of each member of the dive team;

c. the medical certificate of each member of the dive team;

d. for each dive included in this contract, a dive plan containing the following information, in addition to that required under the *Regulation Respecting Occupational health and safety*:

i. The thermal protection to be used;

ii. The repetitive dive factor;

iii. The no-decompression limit;

iv. The circumstances in which the dive must be terminated;

v. The procedures to be followed to ensure that machinery, equipment or devices that could create a hazard have been locked out;

vi. The decompression table to be used, as required;

e. Notification confirming that a system for communicating with the *Service d'assistance médicale pour les urgences en plongée* (Medical assistance service for diving emergency) is available at the diving station at all times.

.4 The Contractor shall take into account the following specific characteristics of the worksite, and adapt its dive plan accordingly:

.5 Where the dive takes place at one of the following locations, provide the Departmental representative confirmation that the authorities concerned have been notified:

a. Upstream or downstream from a hydraulic structure or submerged water line;
b. In marine waterways;
c. In port facilities.

.6 If the dive station is more than 2 metres above the water, provide the Departmental representative:

a. a drawing of the equipment used to transport the worker through the air-water interface, if a device other than a stage is used for that purpose;
b. a drawing of the device used to hoist the stage or other device, unless that device is a crane or boom truck.

.7 If the dive is carried out from a vessel, provide the Departmental representative the following documents:
.a. proof of qualification of the vessel operator;
.b. the vessel's certificate of compliance from Transport Canada.

.8 Before starting the work, carry out an underwater rescue simulation at the site, as required under section 312.31 of the *Règlement sur la santé et la sécurité du travail* (S-2.1, r.13) (Regulation respecting occupational health and safety).

.9 On a daily basis, complete and provide to the Departmental representative a checklist confirming the presence and condition of the equipment required at the dive site as per the dive plan.

.10 Ensure that all other documents required under section XXVI of the *Règlement sur la santé et la sécurité du travail* (S-2.1, r.13) (Regulation respecting occupational health and safety) are available at the construction site at all times (diving logbook, diver's logbook, etc.).

1.28 HEALTH AND SAFETY SUBORDINATION AGREEMENT

Project: _____ **Address:** _____

EXTERNAL CONTRACTOR

I hereby agree to submit to the authority of (name of the Principal Contractor's business) _____, which is the Principal Contractor for the project indicated above during the entire duration of our work on the construction site. Accordingly, I confirm that I have reviewed the Principal Contractor's prevention program, and I agree to:

- inform my employees of the content of the Principal Contractor's prevention program and ensure that its content are complied with at all times;
- apply the prevention program that is specific to the activities that we carry out under this project;
- inform the Principal Contractor of my actions or dealings on the construction site and obtain the Principal Contractor's agreement before the start of work; and
- follow the health and safety directives provided by the representative of the Principal Contractor on the construction site and, depending on requirements, attend training sessions and health and safety meetings organized by the representative of the Principal Contractor.

Name of representative: _____

Name of business: _____

Description of work to be done on the construction site: _____

Approximate dates of work (start-end): _____

Signature: _____ Date: _____

PRINCIPAL CONTRACTOR

I hereby agree to allow the business (name of external contractor) _____ to perform the work under this project indicated above and, as Principal Contractor, to take the necessary steps to protect the health and safety of workers on the construction site. Should the Contractor repeatedly refuse or fail to comply with my directives, I agree to inform PWGSC's Departmental representative of this and to provide documentary evidence of my actions or dealings with the Contractor.

Name of representative: _____

Name of the Principal Contractor's business: _____

Signature: _____ Date: _____

Submit a completed and signed copy to PWGSC's Departmental representative

Part 1 General

1.1 FIRE DEPARTMENT BRIEFING

.1 The Departmental Representative will co-ordinate arrangements for contractor for briefing on Fire Safety at pre-work conference by Fire Chief before work is commenced.

1.2 REPORTING FIRES

.1 Know the location of the nearest fire alarm box and telephone, including emergency phone number.

.2 Report immediately fire incidents to the Fire Department as follows:

.1 Activate nearest fire alarm box; or

.2 Telephone.

.3 Person activating fire alarm box will remain at box to direct Fire Department to scene of fire.

.4 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location.

1.3 INTERIOR AND EXTERIOR FIRE PROTECTION AND ALARM SYSTEMS

.1 Fire protection and alarm system will not be:

.1 Obstructed;

.2 Shut-off; and

.3 Left inactive at end of working day or shift without authorization from Fire Chief.

.2 Fire hydrants, standpipes and hose systems will not be used for other than fire-fighting purposes unless authorized by Fire Chief.

1.4 FIRE EXTINGUISHERS

.1 Supply fire extinguishers, as scaled by Fire Chief, necessary to protect work in progress and contractor's physical plant on site.

1.5 BLOCKAGE OF ROADWAYS

.1 Advise Fire Chief of work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by Fire Chief, erecting of barricades and digging of trenches.

1.6 SMOKING PRECAUTIONS

.1 Observe smoking regulations.

1.7 RUBBISH AND WASTE MATERIALS

.1 Keep rubbish and waste materials at minimum quantities.

.2 Burning of rubbish is prohibited.

.3 Removal:

.1 Remove rubbish from work site at end of work day or shift or as directed.

.4 Storage:

.1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.

.2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove specified.

1.8 FLAMMABLE AND COMBUSTIBLE LIQUIDS

.1 Handling, storage and use of flammable and combustible liquids governed by current National Fire Code of Canada.

.2 Keep flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires permission of Fire Chief.

.3 Transfer of flammable and combustible liquids is prohibited within buildings or jetties.

.4 Transfer of flammable and combustible liquids will not be carried out in vicinity of open flames or any type of heat-producing devices.

.5 Do not use flammable liquids having flash point below 38 degrees C such as naphtha or gasoline as solvents or cleaning agents.

.6 Store flammable and combustible waste liquids, for disposal, in approved containers located in safe ventilated area. Keep quantities minimum and Fire Department is to be notified when disposal is required.

1.9 HAZARDOUS SUBSTANCES

.1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, in accordance with National Fire Code of Canada.

.2 Obtain from Fire Chief a "Hot Work" permit for work involving welding, burning or use of blowtorches and salamanders, in buildings or facilities.

.3 When Work is carried out in dangerous or hazardous areas involving use of heat, provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of Fire Chief. Contractors are responsible for providing fire watch service for work on scale established and in conjunction with Fire Chief at pre-work conference.

.4 Provide ventilation where flammable liquids, such as lacquers or urethanes are used, eliminate sources of ignition. Inform Fire Chief prior to and at cessation of such work.

1.10 QUESTIONS AND/OR CLARIFICATION

.1 Direct questions or clarification on Fire Safety in addition to above requirements to Fire Chief.

1.11 FIRE INSPECTION

.1 Co-ordinate site inspections by Fire Chief through [Departmental Representative] [DCC Representative] [Consultant].

.2 Allow Fire Chief unrestricted access to work site.

.3 Co-operate with Fire Chief during routine fire safety inspection of work site.

.4 Immediately remedy unsafe fire situations observed by Fire Chief.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Pollution and damages to the environment: Presence of chemical elements or agents, either physical or biological, that are harmful to the health and welfare of persons, change the ecological balance of importance for humans and affect the species that play an important role for humans or deteriorate the environment's aesthetic, cultural or historical characteristics.

.2 Environment protection: Prevention/pollution control and control of disturbances to habitats and the environment during construction. The prevention of pollution and damages to the environment targets soils, water, air and biological and cultural resources It also includes the management of visual aesthetics, noise, waste (solid waste, chemicals, gases and liquids), radiating energy, radioactive substances and other pollutants.

1.2 DOCUMENTS AND SAMPLES TO BE SUBMITTED

.1 Required documents and samples will be submitted in accordance with section 01 33 00 "Submittal Procedures".

.2 Prior to construction or the delivery of material to the construction site, an environment protection plan will be submitted to the Departmental Representative for review and approval. The plan will provide a comprehensive overview of the known or potential environmental issues to be resolved during construction.

.3 The level of detail of the actions described in the environment protection plan will be in line with the environmental issues and the construction work to be executed.

.4 The environment protection plan will include:

.1 The name of the persons called upon to respect the plan.

.2 The name and qualifications of the persons who will be responsible for the hazardous waste manifest, which will list the hazardous waste to be removed from the construction site.

.3 The name and qualifications of the persons who will be responsible for training the construction site personnel.

.4 A description of the training program for the personnel assigned to environment protection.

.5 An erosion and sediment transportation prevention plan, which will describe the actions that will be taken, including work monitoring and the production of reports in order to verify compliance with federal, provincial and municipal rules and regulations.

.6 A zoning plan for the work, which will show the various activities in each area. The plan will also describe the measures designed to protect the elements authorized to remain in the work area.

.7 An emergency plan in case of spills, which will include the procedures and instructions to be followed and the reports to be provided in case of unforeseen spills of controlled substances.

.8 A disposal plan for non-hazardous solid waste, which will describe the disposal methods and sites, as well as the waste material from excavation.

.9 An air pollution prevention plan, which will describe measures to keep dust, debris, materials and waste from becoming airborne and transported out of the construction site.

.10 A contamination prevention plan, which will identify the potentially hazardous substances used at the construction site and the actions that will be taken to keep these substances from becoming airborne or penetrating the soil. The plan will also provide detailed information on the measures that will be taken regarding the storage and handling of these substances in order to make sure they will comply with federal, provincial and municipal regulations and legislations.

.11 A wastewater management plan, which will describe the methods and procedures that will be implemented in order to manage the evacuation of wastewater deriving directly from construction activities, e.g. the water that will be used to cure concrete, to wash and clean, from the lowering of the water table, to disinfect, for hydro static tests and to rinse conduits.

.12 A plan to identify and protect wetland and historical, archeological, cultural and biological resources.

.13 A plan showing the configuration and location of bulkheads.

1.3 FIRE AND BURNING

.1 Burning waste with fire at the construction site is strictly prohibited.

.2 The necessary measures will be taken in order to ensure the monitoring of the work and fire protection, in accordance with the instructions provided.

1.4 WASTE DISPOSAL

.1 Burying waste and waste material at the construction site is strictly prohibited.

.2 Disposing of waste or volatile materials, such as solvents of mineral origin, oils or paint solvents, in water courses, storm sewers or sanitary sewers is strictly prohibited.

1.5 DRAINAGE

.1 Anticipate the need for an erosion and sediment transportation prevention plan, which will describe the actions that will be taken, including work monitoring and the production of reports in order to verify compliance with federal, provincial and municipal rules and regulations.

.2 A pollution prevention plan for stormwater may replace the erosion and sediment transportation plan.

.3 Drainage and temporary pumping necessary to keep excavations and the construction site dry will be ensured.

.4 Pumping water containing suspended materials or solids to a water courses, sewer network or evacuation or drainage systems is strictly prohibited.

.5 Water containing suspended material or solids or harmful substances will be disposed of in accordance with the requirements of the local authorities.

1.6 CONSTRUCTION SITE CLEARING AND PLANT PROTECTION

.1 The trees and plants located at the construction site and in adjacent properties will be protected where indicated.

.2 The removal of topsoil and plants will be reduced to a minimum.

1.7 WORK NEAR AND IN WATER COURSES

.1 Using construction materiel in water courses outside of the work area is strictly prohibited.

.2 Borrow material will not be taken from the beds of water courses, with the exception of the material required for the construction of the water intake.

.3 Filling and waste material, as well as debris, will not be unloaded in water courses, with the exception of the material required to build bulkheads. The use of these materials will require approval prior to their placement.

1.8 POLLUTION PREVENTION

.1 Temporary facilities installed to prevent erosion and pollution in the context of this contract will undergo maintenance.

.2 Emissions produced by the equipment and tools will be controlled in accordance with the requirements of the local authorities.

.3 Temporary shelters will be built in order to keep dust created by sanding and other foreign materials from contaminating the air and water outside of the work area.

.4 Dust control liquid will be used on dry material and waste will be covered in order to keep dust and debris from becoming airborne and carried away. Dust in temporary accesses and roads will be controlled.

1.9 PRESERVATION OF HISTORIC/ARCHAEOLOGICAL CHARACTER

.1 Anticipate the need for a plan that will define the procedures to follow in order to identify and protect wetlands and historical, archaeological, cultural and biological resources known to be located at the construction site and/or that will define other procedures to follow should unforeseen elements be discovered at or near the construction site during construction.

.2 The plan will describe the methods that will be used to protect known or newly discovered resources, as well as the means of communication between the General Contractor’s personnel and the Departmental Representative.

1.10 NOTICE OF NON-COMPLIANCE

.1 The Departmental Representative will send a written notice of non-compliance to the General Contractor every time that a law, regulation or federal, provincial or municipal permit is violated, or when a violation of any other element of the environment protection plan implemented by the General Contractor will be observed.

.2 Following the reception of a notice of non-compliance, the General Contractor will propose corrective actions to the Departmental Representative and implement said actions following approval by the Departmental Representative.

.3 The Departmental Representative will stop the work until satisfactory corrective measures are taken.

.4 Postponement or adjustments regarding the suspension of work will not be authorized.

Part 2 Products

2.1 NOT APPLICABLE

.1 Not applicable.

Part 3 Execution

3.1 NOT APPLICABLE

.1 Not applicable.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 The Departmental Representative will have access to the structures. If part of the work or structures is executed outside of the construction site, the Departmental Representative will also be given access to the said location for the entire duration of the work.

.2 Should the structures require inspection, special tests and approvals requested by the Departmental Representative or by local regulations with regard to the construction site, requests for inspection will be made within a reasonable time.

.3 If the General Contractor covered or allowed the covering of a structure prior to inspection, special testing or approval, he will uncover the structure, see that they are inspected and tested to the satisfaction of the appropriate authorities and cover the structure again as before.

.4 The Departmental Representative may demand the inspection of any part of the structure when conformity to the requirements of the contractual documents is in doubt. If the structure is declared non-compliant with the requirements of the contractual documents, the General Contractor will take the necessary measures so that the structure is compliant with the said requirements and pay for the inspection and repairs.

1.2 INDEPENDENT TESTING AND INSPECTION

.1 The Departmental Representative will hire the services of independent testing and inspection firms regarding the quality control of aggregates and concrete. The cost of these services will be paid by the Departmental Representative.

.2 Using the services of testing and inspection firms will not relieve the General Contractor of his responsibility in any way regarding the execution of the work in accordance with the requirements of the contractual documents.

.3 If deficiencies are observed during testing and/or inspection, the designated service provider will require additional tests and/or inspections in order to accurately determine the nature and scale of the deficiencies. The General Contractor will correct the said deficiencies in accordance with the instructions of the Departmental Representative at no additional cost to the Departmental Representative.

1.3 ACCESS TO THE CONSTRUCTION SITE

.1 The inspection and testing service provider will be given access to the construction site and to the manufacturing and assembly shops located outside of the construction site.

.2 The General Contractor will collaborate with these service providers and take reasonable actions to grant them the required access.

1.4 PROCEDURE

.1 The service provider and the Departmental Representative will be notified in advance of impending testing in order to ensure that every party involved may be in attendance.

.2 The samples, the compliance certificates, the concrete mix and/or materials necessary for testing will be submitted in accordance with the prescriptions of the specifications, within a reasonable delay and based on a predetermined sequence in order not to delay the execution of the work.

.3 The labour and facilities required for the sampling and handling of the samples/materials at the construction site will be provided. Anticipate the need to provide adequate space for sample storage and curing.

1.5 REJECTED STRUCTURES OR WORK

.1 The defective elements deemed non-compliant with the contractual documents and rejected by the Departmental Representative, either because they have not been executed in accordance with trade practices or built using defective materials or products, will be removed, even if they have already been integrated. The elements in question will be replaced or executed again in accordance with the requirements of the contractual documents.

.2 If applicable, the work of other contractors that has been damaged during the rehabilitation or replacement of the non-compliant elements will be repaired without delay.

.3 If, in the opinion of the Departmental Representative, it is not necessary to repair the structures deemed deficient or non-compliant with the contractual documents, the Departmental Representative will deduct the difference in value between the structure executed and that which is indicated in the contractual document from the contractual price. The amount for this difference will be determined by the Departmental Representative.

1.6 REPORTS

.1 The Departmental Representative will be provided with four (4) test and inspection reports.

.2 The sub-contractors responsible for the work or structures inspected and tested will be provided with copies of these reports.

1.7 TESTS AND MIX PROPORTIONS (DOSAGE)

.1 The required testing reports and mix proportions will be provided.

.2 The cost of the testing and mix proportions not specifically required in the contractual documents or by local regulations with regard to the construction site will be submitted for approval to the Departmental Representative and may eventually be reimbursed.

1.8 SAMPLES OF THE WORKS

.1 The samples of the works specifically required in the specifications will be taken. The requirements of this article applies to every section of the specifications where samples are requested.

.2 The samples will be taken at the locations approved by the Departmental Representative and indicated in the relevant sections of the specifications.

.3 The samples to be approved by the Departmental Representative will be taken within a reasonable timeframe and in the appropriate sequence in order not to delay the execution of the work.

.4 Sampling delays will not constitute grounds to extend the work schedule. Requests to that effect will not be granted.

.5 If necessary, the Departmental Representative will help the General Contractor establish a sampling schedule.

.6 Samples of work will be removed from the site at the end of the work or when indicated by the Departmental Representative.

.7 Samples of work may be part of the finished project.

.8 Whether or not the samples may be part of the finished project and when they may be removed, if applicable, is indicated in each section of the specifications where samples of work are specifically mentioned.

1.9 FACTORY TESTS

.1 The factory tests certificates required in the various sections of these specifications will be submitted for approval.

1.10 MATERIALS, DEVICES AND SYSTEMS

.1 Fine-tuning and balancing reports related to mechanical and electrical systems will be submitted for approval.

Part 2 Products

2.1 NOT APPLICABLE

.1 Not applicable.

Part 3 Execution

3.1 NOT APPLICABLE

.1 Not applicable.

END OF SECTION

Part 1 General

1.1 DOCUMENTS AND SAMPLES FOR SUBMITTAL

.1 The required documents and samples will be submitted in accordance with section 01 33 00 “Submittal Procedure”.

1.2 MATERIAL PLACEMENT AND REMOVAL

.1 A location plan showing the proposed area to be used by the General Contractor will be prepared.

.2 The areas that will need to be covered in gravel in order to prevent mud puddles will be indicated.

.3 Any additional area or transit area will be indicated.

.4 The construction site facilities required for the execution of the work as soon as possible will be provided and installed.

.5 The construction site facilities will be dismantled and removed when they will no longer be needed.

1.3 ON SITE STORAGE/PERMITTED LOADS

.1 The work will be executed within the area and boundaries indicated in the contractual documents. The site will not be encumbered unreasonably with materials.

.2 The works will not be overloaded or allowed to be overloaded in order to preserve the structural integrity.

1.4 PARKING AT THE CONSTRUCTION SITE

.1 Parking at the construction site will not be allowed, except to load or unload material and equipment.

.2 Suitable access roads to the construction site will be built and maintained.

.3 All of the travel paths used will be cleaned.

1.5 STORAGE OF MATERIALS AND TOOLS

.1 Anticipate the need for weatherproof locked sheds for the storage of materials and tools, which will be kept clean and tidy.

.2 The materials that will not require shelter from the weather may be left at the construction site. However, their storage will not hinder the work and activities of the Institut Maurice-Lamontagne.

1.6 LIFTING EQUIPMENT

.1 The lifting equipment necessary to move materials and equipment will be provided, installed, maintained and handled.

.2 The wenches will be handled by qualified personnel.

1.7 LIFTS AND FREIGHT ELEVATORS

.1 The existing lifts and freight elevators will not be used to move personnel and materials. If their use is necessary, coordination with the Departmental Representative is required. The pumping station will be accessed directly through the back door of the Institut Maurice-Lamontagne.

.2 Anticipate the need to cover and protect the finished surfaces of elevator cabins and doors.

1.8 SANITARY FACILITIES

.1 Sanitary facilities for the labour will be provided in accordance with the relevant orders and regulations.

.2 The required signs will be posted and all of the precautions required by local sanitation authorities will be taken. The site and sector will be kept clean.

1.9 CONSTRUCTION SITE OFFICE AND TELEPHONE

.1 The General Contractor will build a 20 m^2 office to be used exclusively by the Departmental Representative. It will contain a table for the review of plans, a rack for the plans, shelves, chairs, etc. This office will be conveniently located, suitably equipped (chemical toilet, etc.), heated, secured and cleaned and tidied on a daily basis. It will also be equipped with a telephone and high speed internet to be used exclusively by the Departmental Representative.

.2 The General Contractor will also provide one (1) cellular phone with a Bluetooth hands free features, as well as a rechargeable battery and charger with enough autonomy to be used for an entire day of work All of the expenses pertaining to communications will be paid by the General Contractor, including (without being limited to) basic telephone fees, rental fees, long distance calls, and repairs or replacement if the device breaks down or is lost or stolen.

1.10 TRAFFIC PROTECTION AND MAINTENANCE

.1 If needed, access lanes and temporary bypass lanes will be created in order to maintain traffic.

.2 Unless otherwise indicated by the Departmental Representative, traffic on the lanes mentioned above will be maintained and protected.

.3 Anticipate the need to take measures in order to protect and divert traffic, including hiring supervisors and flag persons, the installation of barricades, the installation of lighting devices around and in front of the equipment and the work area, the installation and maintenance of traffic signs, danger signs and other appropriate guiding signs.

.4 The public and staff of the Institut Maurice-Lamontagne will be protected against damages to persons and property.

.5 Rolling equipment belonging to the General Contractor for the transportation of material entering or exiting the construction site will hinder traffic to the Institut Maurice-Lamontagne as little as possible.

.6 The adequacy of the existing traffic lanes and authorized loads will be verified. The General Contractor is responsible for repairing damaged lanes as a result of the construction work.

.7 The necessary access paths and tracks will be built.

.8 Existing accesses to the Institut Maurice-Lamontagne will not be restricted or blocked.

.9 The necessary dust control measures will be taken in order to ensure safe activities at all times.

.10 The location, slope, width and layout of the access lanes and paths to the construction site are subjected to approval from the Departmental Representative.

.11 Anticipate the removal of snow during the construction period.

.12 After the completion of the work, the access lanes and paths indicated by the Departmental Representative will be dismantled and reconfigured, The new layout will match that which existed before the beginning of the work.

1.11 CONSTRUCTION SITE SIGNS

.1 The General Contractor will anticipate the need for construction site signs adapted to site conditions.

.2 The signs will identify all of the physical obstacles, such as materials, trenches, etc., and guide the construction staff and the personnel from the Institut Maurice-Lamontagne toward safe areas.

.3 All of the trenches will be marked at night and during week-end.

1.12 CLEANING

.1 Debris, waste and packing material will be removed from the site on a daily basis.

.2 Dust and mud will be removed from hard road surfaces.

.3 The materials recovered during demolition will be stored.

.4 New or recovered materials will not be stored in the construction site facilities.

Part 2 Products

2.1 NOT APPLICABLE

.1 Not applicable.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

.1 Temporary means to control erosion and sediments will be implemented in order to avoid the loss of soil resulting from runoff or wind and to keep the said soil from depositing on adjacent properties or pedestrian paths. These means of control will be implemented in accordance with the requirements of the appropriate authorities (Quebec government authority on transportation).

.2 The implemented means of control will be inspected in order to ensure maintenance and repairs, if necessary, until permanent vegetation is established.

.3 The means of control will be removed when appropriate. The surfaces disturbed during construction will be restored and stabilized.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189-[00], Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-FM1978(C2003), Douglas fir plywood.

1.2 MATERIAL INSTALLATION AND REMOVAL

.1 Temporary access and protection structures will be provided, installed or built in order to allow the execution of the work as soon as possible.

.2 The material will be dismantled and removed from the construction site when no longer needed.

1.3 GUARD RAILS AND BARRIERS

.1 Guard rails and rigid barriers will be supplied and installed around deep excavations, and utility shafts and open stairwells will be installed along the edges of floors, roofs and other hazardous locations.

.2 These elements will be supplied and installed in accordance with the requirements of appropriate authorities.

1.4 WEATHERPROOF SHELTERS, ENCLOSURES AND ACCESS CLOSURES

.1 Closing devices will be installed to weatherproof door and openings, open stairwells and other openings in doors and roofs.

.2 Floors where walls will not yet be built will be covered. The other openings will be sealed. Enclosures will be installed inside the building where temporary heating will be required.

.3 The enclosures will support loads caused by wind and snow.

1.5 DUST SCREENS

.1 Dust screens or isolating partitions will be installed to close the areas where dust generating activities will take place in order to protect workers, the public and finished surfaces or areas.

.2 The screens will be preserved and moved as needed until said activities are complete.

1.6 ACCESS TO THE CONSTRUCTION SITE

.1 The pedestrian paths, ramps and crossings necessary to access the construction site will be built.

1.7 ROAD TRAFFIC

.1 Qualified flag persons will be hired when required. Anticipate the need for the signs and barriers necessary for the execution of the work and to protect the public.

1.8 EMERGENCY VEHICLES ACCESS

.1 Emergency vehicles will have access to the construction. Anticipate sufficient height clearance.

1.9 PROTECTION OF NEARBY PUBLIC AND PRIVATE PROPERTIES

.1 Nearby public and private properties will be protected against all damages that may be caused by the work.

.2 The General Contractor will take full responsibility for the damages.

1.10 PROTECTION OF THE BUILDING'S FINISHED SURFACES

.1 For the entire duration of the work, partially or completely finished material and surfaces will be protected.

.2 Anticipate the necessary screens, tarpaulins and barriers.

.3 The location of the protection devices and the installation schedule will be confirmed with the Departmental Representative three (3) days prior to installation.

.4 The General Contractor will take full responsibility for damages to the structure as a result of a lack of protection or inappropriate protection.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Waste will be sorted for reuse or recycling in accordance with section 01 74 21 "Construction/Demolition Waste Management and Disposal".

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Relevant standards may be referred to in each section of the specifications.

.2 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 Should there be doubt as to the compliance of some products or systems versus relevant standards, the Departmental Representative reserves the right to verify through testing.

1.2 QUALITY

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in work will be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 The procurement policy aims at acquiring, at minimal cost, items containing the largest percentage or recycled and reused materiel as possible, while maintaining satisfactory levels of competitiveness. Reasonable efforts will be made to use recycled/reused material for the execution of both work and structures.

.3 Defective products, whenever identified prior to completion of work, will be rejected, regardless of previous inspections. Inspection does not relieve the General Contractor from responsibility, but is precaution against oversight or error. The General Contractor will remove and replace defective products at his own expense and be responsible for delays and expenses caused by rejection.

.4 Should any dispute arise as to quality or fitness of products, decision rests strictly with the Departmental Representative based upon requirements of contract documents.

.5 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Owner’s Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of work

.2 In event of failure to notify the Departmental Representative at commencement of work and should it subsequently appear that work may be delayed for such reason, the Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of the Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Owner’s Representative satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of work.

.2 Unload, handle and store said products.

1.6 MANURACTURER’S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify the Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Owner’s Representative may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Owner’s Representative to require removal and re-installation at no increase in contract price or contract time.

1.7 QUALITY OF WORK

.1 Ensure that the quality of work is of the highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify the

Departmental Representative if required work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. The Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of quality of work in cases of dispute rest solely with the Departmental Representative, whose decision is final.

1.8 COORDINATION

.1 Ensure cooperation of workers in laying out work. Maintain efficient and continuous supervision.

.2 The General Contractor will be responsible for the coordination and placement of openings, sleeves and accessories.

1.9 CONCEALEMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform the Departmental Representative if there is interference. Install as directed by the Departmental Representative.

1.10 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of work identified as defective or unacceptable. Coordinate adjacent affected work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of work.

1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 The Departmental Representative will be informed of any issue deriving from the location of a fixture. Install as directed.

1.12 FASTENINGS - GENERAL

.1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur.

.2 Prevent electrolytic action between dissimilar metals or materials.

.3 Use non-corrosive hot-dipped galvanized steel fasteners, anchors and spacers for securing exterior work, unless stainless steel or other material is specifically requested in affected specification section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood plugs or plugs made of any other organic material are not acceptable.

.5 Inasmuch as possible, concealed fasteners will be used. Space evenly and lay out neatly.

.6 Fastenings which cause Spalding or cracking are not acceptable.

1.13 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for expected service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of the Departmental Representative

1.15 EXISTING UTILITIES

.1 When connecting to existing services or utilities, execute work at times directed by the Departmental Representative, with minimum of disturbance to work and/or the building's occupants and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service

Part 2 TRAINING OF OPERATION PERSONNEL

2.1 ADMINISTRATIVE DETAILS

.1 Two (2) weeks prior to the conditional end date of the work, demonstrate for the Departmental Representative's staff the operation and maintenance of the devices, materials and system installed as per sections 01 91 13 and 01 91 33).

.2 Contact the Departmental Representative in order to obtain a list of the staff that will receive training and ensure that they will receive said training when appropriate. All of the training sessions will take place at the Institut Maurice-Lamontagne.

.3 Preliminary work

.1 Make sure that the conditions under which the demonstrations of material, devices and systems take place are in accordance with the requirements.

.2 Make sure that the persons identified for training are in attendance.

.3 Make sure that the devices, material and systems have been inspected and started-up in accordance with sections 01 91 13 and 01 91 33.

.4 Make sure that the testing, fine-tuning and balancing have been carried out in accordance with section 01 91 13 “Genera Commissioning Requirements” and that the devices, material and systems are fully operational.

.4 Demonstration and training

.1 Demonstrate the start-up, operation, control, fine tuning, troubleshooting and maintenance for each device, material and system at the scheduled times and places.

.2 Teach the staff all operation and maintenance stages related to the devices, material and systems using the operation and maintenance manuals provided.

.3 Carry out a detailed review of the said manuals in order to explain all aspects of operation and maintenance.

.4 If necessary, collect additional information required for training and include them in the operation and maintenance manuals.

2.2 TRAINING MODALITIES AND DURATION

.1 The General Contractor will plan, coordinate and provide training to the operation personnel. The following are added to the requirements of this item of the specifications:

.1 At start-up, submit a training plan and schedule to the Departmental Representative for approval.

.2 During training, explain to the operation personnel the operation and maintenance of all equipment supplied and installed.

.3 Training will take place during dedicated periods of time. Training will not take place during start-up and testing.

.4 Training will take place when the equipment will be operational and the approved operation manuals are available.

.5 Training will be provided in part before the conditional acceptance of the work. Other training days will take place approximately six (6) months after the facility is in use.

.6 Training will be planned and provided by qualified representatives of the suppliers involved. Training will include theory on equipment operation, as well has hands-on training.

.7 Following training, the Departmental Representative will be provided with a written document summarizing the training provided.

.8 The training durations indicated in the following table are considered the minimum training required.

TRAINING SESSIONS RAW SEA WATER PUMPING SYSTEM FILTERED SEA WATER PUMPING SYSTEM		
EQUIPMENT – Process Engineering	**DURATION (d)**	
	Before Conditional Acceptance of the work	**Before Final Acceptance of the work**
Pumps and accessories	2.0	1.0
Valves and accessories	1.0	0.5
Instrumentation (level switches), air valve with level sensor	1.0	0.5
Controls and accessories	1.0	1.0

.9 Unused training periods will be converted into time for service calls (1 day of training = 1 one-day service call at the facility) under a written agreement between the General Contractor and the Departmental Representative. The latter will be provided with a copy of this agreement.

2.3 DOCUMENTS/SAMPLES FOR APPROVAL/INFORMATION

.1 The documents and samples required will be submitted in accordance with section 01 33 00 “Submittal Procedure”.

.2 Two (2) weeks before the expected dates, the Departmental Representative will be provided with a schedule indicating the dates and times of the operation demonstrations for each device, material and system, for approval.

.3 During the week following the demonstrations, documents confirming that the latter did take place and that appropriate training was satisfactory given will be submitted.

.4 The date and time of each demonstration will be indicated, as well as the persons in attendance.

.5 Complete copies of the operation and maintenance manuals used to demonstrate the operation of the devices, material and systems and to provide related training will be provided.

2.4 QUALITY ASSURANCE

.1 In accordance with the sections stating that an authorized representative of the suppliers must demonstrate the operation of the devices, materials and systems installed:

.1 Ensure that the Departmental Representative’s staff receives the training;

.2 Provide a written document confirming that the demonstration has taken place and that the related training was provided.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Client documents indicating property limits and existing land survey control points.

1.2 LAND SURVEYOR QUALIFICATIONS

.1 Qualified registered land surveyor, licensed to practise at the location of the project site and deemed acceptable by the Departmental Representative.

1.3 SURVEY REFERENCE POINTS

.1 Make no changes or relocations to the control points or without prior written notice to the Departmental Representative.

.2 Report to the Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.3 Require surveyor to replace control points in accordance with original survey control.

1.4 SURVEY REQUIREMENTS

.1 Establish two (2) permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, and determine locations and layouts by instrumentation.

.3 Stake the site for grading, fill and topsoil placement and landscaping.

.4 Stake the slopes.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation, column locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.5 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of work and notify the Departmental Representative of findings

.2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by the Departmental Representative

1.6 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance

.3 Inform the Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by the Departmental Representative

1.7 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 Once the foundations and main field work is complete, prepare a certified topographic survey indicating dimensions, locations, angles and elevations of the structures.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.8 SUBMITTALS

.1 Submit name and address of Surveyor to the Departmental Representative.

.2 On request of the Departmental Representative, submit documentation and samples required to verify the accuracy of the geotechnical studies.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed work that conform and do not conform with the contract documents.

1.9 SUBSURFACE CONDITIONS

.1 Promptly notify Consultant in writing if subsurface conditions at the place of work differ materially from those indicated in the contract documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should the Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in work.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 “Submittal Procedures”.

.2 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.3 Include in request:

- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 “Submittal Procedures”.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching [including excavation and fill,] to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.6 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.7 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.8 Restore work with new products in accordance with requirements of Contract Documents.

.9 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.10 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.11 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE

1.2 PROJECT CLEANLINESS

.1 Keep the work site tidy, free from accumulation of waste products and debris.

.2 Remove waste materials and debris from site at the end of each working day, at scheduled times or in accordance with the instructions of the Departmental Representative. Do not burn waste materials on site.

.3 Clear snow and ice from access to building. Deposit snow in piles in designated areas only.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for the disposal of waste and debris.

.5 Dispose of debris and material in landfill areas authorized by appropriate authorities.

.6 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.3 FINAL CLEANING

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining work.

.2 Prior to the final inspection, remove surplus products, tools, construction machinery and materials.

.3 Remove debris and waste.

.4 Remove waste materials from the site at regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site, Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds,

.8 Remove dirt and other disfiguration from exterior surfaces.

.9 Sweep and wash clean paved areas.

.10 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

.11 Remove snow and ice from access to building.

1.4 FLUSHING OF EQUIPMENT AND PIPES

.1 Prior to commissioning, the equipment will be flushed in order to remove any construction debris.

.2 Before filling the reservoirs of Block D, all pipes will be flushed with sea water.

.3 Flexible tubing, drainage pumps and any other equipment required for the execution of the work described in this section will be provided by the General Contractor. The water used for flushing will be discharged where instructed by the Departmental Representative

Part 2 Products

2.1 NOT APPLICABLE

.1 Not applicable

Part 3 Execution

3.1 NOT APPLICABLE

.1 Not applicable.

END OF SECTION

Part 1 General

1.1 OBJECTIFS EN MATIÈRE DE GESTION DES DÉCHETS

.1 The objective in terms of waste management is to reduce as much as possible the total flow of construction/demolition waste to landfill sites. The Departmental Representative will be provide with documents attesting that comprehensive waste management measures and procedures regarding the reuse/recycling/salvaging of reusable/recyclable materials were implemented or followed.

.2 Exercise maximum control of solid construction waste.

.3 Protect the environment and prevent pollution and environmental impacts.

1.2 DEFINITIONS

.1 Class III Non-hazardous Materials: Construction, renovation and demolition waste.

.2 Landfill - Inert Waste: bitumen-bound materials and concrete exclusively.

.3 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

.4 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.5 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.6 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.7 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.8 Separate Condition: Refers to waste sorted into individual types.

.9 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

1.3 STORAGE, HANDLING AND PROTECTION

.1 Store the waste material where indicates by the Departmental Representative for reuse/recycling/salvaging.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to approved local facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify the department having jurisdiction.

.7 Protect surface drainage, mechanical and electrical, from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Bring the waste material collected together indiscriminately at a facility located away from the construction site for separation.

.3 Provide a bill of lading for the sorted waste.

1.4 DISPOSAL OF WASTE

.1 Do not bury rubbish or waste materials

.2 Do not dispose of any waste, volatile materials, solvent naphta, hydrocarbons and paint solvent into waterways, storm, or sanitary sewers

.3 Keep records of construction waste and include the following information.

.1 The number of containers and their size.

.2 The type of waste in each container.

.3 The total tonnage of waste.

.4 The total tonnage of reused/recycled/salvaged waste.

.5 The destination of the reused/recycled/salvaged waste.

.4 Recover materials from deconstruction as deconstruction/disassembly work progresses

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.5 SCHEDULING

.1 Coordinate work with other activities at site to ensure timely and orderly progress of work.

Part 2 Execution

2.1 APPLICATION

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

2.2 CLEANING

.1 Remove tools and waste materials on completion of work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

.1 Submit the documents and samples in accordance with section 01 33 00 “Submittal Procedure”.

.2 Personnel experienced in maintenance and operation of described products will prepare the instructions and data.

.3 The submitted documents will be returned after final inspection, with the Departmental Representative’s comments.

.4 Revise content of documents as required prior to final submittal.

.5 Two weeks prior to substantial performance of the work, submit to the Departmental Representative, four (4) final copies of operating and maintenance manuals in French.

.6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in work.

.7 If requested, furnish evidence as to type, source and quality of products provided.

.8 Defective products will be rejected, regardless of previous inspections. Replace products at the General Contractor’s own expense.

.9 The General Contractor will pay the costs of transportation.

1.2 FORMAT

.1 Organize data in the form of an instructional manual.

.2 Use binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project, project number and identify subject matter of contents.

.5 Arrange content logically based on operation sequence, the specification section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment

.7 Text: Manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide scaled CAD files in DWG format on CD. Also provide electronic files in PDF format.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents:

.1 Provide title of the project;

.2 Submittal date;

.3 Name, address, and telephone numbers of the General Contractor, as well as the names of his representatives;

.4 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 “Quality Control”.

1.4 AS-BUILTS AND SAMPLES TO FILE AS PROJECT DOCUMENTS

.1 In addition to requirements in General Conditions, maintain at the site for the Departmental Representative one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of blue line opaque drawings and in a copy of the project file provided by the Departmental Representative

.2 Record information using felt tip marking pens, maintaining a different color pen for each system.

.3 Record information concurrently with construction progress. Do not conceal work until required information is recorded.

.4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: submit manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.6 EQUIPMENT AND SYSTEMS

.1 Each item of equipment and each system: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports required in sections 01 45 00 “Quality Control” and 01 91 13 “Commissioning Requirements”.

.15 Additional requirements: As specified in individual specification sections.

1.7 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

1.8 MAINTENANCE MATERIALS

.1 Spare parts

.1 Provide items of same manufacture and quality as items in work.

.2 Deliver to site location as directed; place and store.

.3 Receive and catalogue all items.

.4 Submit inventory listing to Owner’s Representative

.5 Include approved listings in Maintenance Manual.

.6 Obtain receipt for delivered products and submit prior to final payment.

1.9 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of the Departmental Representative.

1.10 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties..

.2 Thirty (30) days prior to the pre-warranty conference, submit warranty management plan to Owner’s Representative’s approval.

.3 Warranty management plan to include required actions and documents to assure that the Client receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Prior to the presentation of each monthly payment estimate, submit to the Departmental Representative the information relating to the warranties obtained at the construction stage of the project, for approval.

.6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

.8 Four (4) and nine (9) months after the date of acceptance of the work, perform a warranty inspection with the Departmental Representative.

.9 Include information contained in warranty management plan as follows.

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.10 Provide a list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item, material, system or construction package.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.11 Expression of interest from the General Contractor as to his attendance for the inspection to be held four (4) and nine (9) months after the completion of the relevant work.

.12 Procedure and status of tagging of equipment covered by extended warranties.

.13 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.14 Respond in a timely manner to oral or written notification of required construction warranty repair work or troubleshooting.

.15 Written verification will follow oral instructions. Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.11 PRE-WARRANTY CONFERENCE

.1 Meet with Owner’s Representative to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Owner’s Representative.

.2 Owner’s Representative will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determine priorities for type of defect.

.3 Determine reasonable time for response.

.3 Provide the name, address and telephone number of the company bonded to troubleshoot or repair items under warranty.

.4 Make sure that the contract person's office is located in the local service area where the item/structure under warranty is located, that he/she is available at all times and that he/she can respond to requests for information regarding troubleshooting/repairs under the warranty.

1.12 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by the Departmental Representative.

.2 Affix the tags using a copper wire and spray a coat of waterproof silicone on the wire.

.3 Indicate the dates of acceptance until the item/structure is accepted for occupancy.

.4 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 General Contractor's signature.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two (2) weeks prior to date of interim completion.

.2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:

.1 Verify conditions for demonstration and instructions comply with requirements.

.2 Verify designated personnel are present.

.3 Ensure equipment has been inspected and put into operation in accordance with the requirements.

.4 Ensure testing, adjusting, and balancing has been performed [in accordance with Section 01 91 13 “General Commissioning (Cx) Requirements” and that the equipment and systems are fully operational.

.4 Demonstration and Instructions:

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time allocated for Instructions: ensure amount of time required for instruction of each item of equipment in accordance with the various applicable sections of the specifications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 “Submittal Procedures”.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two (2) weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions, as well as other related training sessions.

1.3 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Owner's personnel.

.2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.

.2 Acronyms:

.1 BMM - Building Management Manual.

.2 Cx - Commissioning.

.3 EMCS - Energy Monitoring and Control Systems.

.4 O&M - Operation and Maintenance.

.5 PI - Product Information.

.6 PV - Performance Verification.

.7 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:

.1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.

.2 Ensure appropriate documentation is compiled into the BMM.

.3 Effectively train O&M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.

.1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.

.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

.1 Cx to be a line item of Contractor's cost breakdown.

.2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built [facility] is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

.4 Departmental Representative will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by [Departmental Representative] [DCC Representative] [Consultant].

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

.1 Before construction:

.1 Review contract documents, confirm by writing to Departmental Representative.

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During construction:

.1 Coordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:

.1 Have completed Cx Plan up-to-date.

.2 Ensure the installation of related components, equipment, sub-systems, systems is complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

.5 Understand completely design criteria and intent and special features.

.6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section “01 33 00 - Submittal Procedures”.

.1 Submit no later than [4] weeks after award of Contract:

.1 Name of Contractor's Cx agent.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

.2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least eight (8) weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least eight (9) weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.8 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 “Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for Requirements and Instructions for Use”.

.2 Departmental Representative to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule.

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:

.1 Approval of Cx reports.

.2 Verification of reported results.

.3 Repairs, retesting, re-commissioning, re-verification.

.4 Training.

1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.5 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.

.6 Ensure subcontractors and relevant manufacturer representatives are present at Cx meetings as required.

1.11 STARTING AND TESTING

.1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide fourteen (14) days notice prior to commencement.

.2 Departmental Representative to witness of start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Departmental Representative.

.3 Arrange for Departmental Representative to witness tests.

.4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System PV: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

.4 Document require tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.

.3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.

.1 Rejected equipment to be remove from site and replace with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Start-up reports,

.5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 Operate and maintain systems for length of time required for commissioning to be completed.

.3 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

.1 Notify Departmental Representative at least twenty-one (21) days prior to start of Cx.

1.19 INSTRUMENTS / EQUIPMENT

.1 Submit to Departmental Representative for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders.

.3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under actual operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities and verify results.

1.22 REPEAT VERIFICATIONS

.1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:

.1 Verification of reported results fail to receive Departmental Representative's approval.

.2 Repetition of second verification again fails to receive approval.

.3 Departmental Representative deems Contractor's request for second verification was premature.

1.23 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.24 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

.2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.25 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.26 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected items.

1.27 TRAINING

.1 In accordance with Section 01 61 00 “Common Product Requirements”.

1.36 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

END OF SECTION

DIVISION 2 – EXISTING CONDITIONS

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 01 00 10 – General Instructions.

1.2 SITE CONDITIONS

.1 Review "Designated Substance Report" and take precautions to protect environment.

.2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.

.1 Proceed only after receipt of written instructions have been received from Departmental Representative.

.3 Notify Departmental Representative before disrupting building access or services.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 EXAMINATION

.1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

3.2 PREPARATION

.1 Protection of In-Place Conditions:

.1 Keep noise, dust, and inconvenience to occupants to minimum.

.2 Protect building systems, services and equipment.

.3 Provide temporary dust screens, covers, railings, supports and other protection as required.

.4 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Demolition/Removal:

.1 Remove items as indicated.

3.3 CLEANING

.1 Progress cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave work area clean at end of each day.

.2 Final cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Refer to demolition drawings and specifications for items to be salvaged for reuse.

.4 Waste management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

DIVISION 3 – CONCRETE

Part 1 General

1.1 SCOPE OF WORK

.1 Provide all materials, equipment and labour require for the construction and installation of the formwork in order to build all of the concrete structures listed on the plans or necessary to complete the project.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 “Submittal Procedures”.

.2 Submit shop drawings for formwork and falsework.

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the province of Quebec, Canada.

.3 The shop drawings will indicate the method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and comply with CAN/CSA-S269.3 for formwork drawings.

Part 2 Products

2.1 MATERIALS

.1 Construction lumber: plywood and wood forms compliant with the CSA/A23.1 standard. For exposed surfaces, use new high density overlaid plywood, in accordance with the CSA O121 standard.

.2 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.3 Cone filling: “Sikatop 122 », « Emaco FS », from BASF or approved equivalent.

.4 Construction joint caulking: Sikatop 2C or approved equivalent.

.5 Material for temporary shoring: in accordance with the CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with the CSA S269.1 standard.

.5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.10 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.11 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 TOLERANCES

.1 The following tolerances apply to the concrete elements:

.1 Water intake: 20 mm. However, the structural steel covering must be respected (75 mm).

.2 Block of concrete: 6 mm.

.3 Flatness of the concrete slabs: 6 mm over a distance of 3 m.

3.3 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 3 days for the water intake.

.2 2 days for the concrete blocks.

.2 Remove formwork when concrete has reached 70 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 Provide all materials, equipment and labour require for the construction and installation of the structural steel in order to build all of the concrete structures listed on the plans or necessary to complete the project.

.2 Provide and install all chairs, fastening bars and spacings, as required to support the bars or rods.

1.2 REFERENCES

1. CSA International and ASTM:

.1 CSA-A23.1-F09]/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A23.3-F04 (R2010), Design of Concrete Structures.

.3 CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-F04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-FM92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186-FM1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.7 ASTM A123/A123M “Standard Specification for Zinc ((Hot-dip Galvanized) Coatings on Iron and Steel Products.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

1. Shop Drawings:

1. Submit drawings stamped and signed by professional engineer registered or licensed in the province of Quebec, Canada.

.1 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

2. Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

3. All of the bars for the water intake will be made of hot-dip galvanized steel.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 “Common Product Requirements”.

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

.3 Storage and handling requirements:

.1 Store materials off ground in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Take all necessary precautions in order not to damage galvanization.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.

.4 Tie wire: cold-drawn steel wire for concrete reinforcement: to ASTM A 82/A 82M.

.5 Reinforcement wire: high-strength wire for concrete reinforcement: to ASTM A 82/A 82M.

.6 Welded steel wire fabric: to ASTM A 185/A 185M.

.7 Galvanizing of non-prestressed reinforcement at the water intake: to CAN/CSA-G164.

.1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.

.2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

.1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.

.3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.

.1 In this case, no restriction applies to temperature of solution.

.4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.

.1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.8 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.9 Mechanical splices: subject to approval of Departmental Representative.

.10 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2.

.2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide the Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.

.2 Upon request, inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 PREPARATION

.1 Galvanizing to include chromate treatment.

.1 Duration of treatment to be 1 hour per 25 mm of bar diameter.

.2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative and DCC Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 When paint is dry, apply thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

3.4 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

3.5 CLEANING

.1 Progress cleaning: clean in accordance with Section 01 74 11 “Cleaning”.

.1 Leave work area clean at end of each day.

.2 Final cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 “Cleaning”.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 – Concrete Forming and Accessories

.2 Section 03 20 00 – Concrete Reinforcing

1.2 MATERIAL TO BE INSTALLED

.1 Anchors, bolts, sleeves and other elements to be incorporated in concrete.

1.3 OPENINGS

.1 Unless otherwise indicated on the plans, the openings required for the passage of HDPE pipes or other elements not indicated on the plans are included in the work. Follow the instructions of the Engineer.

1.4 REFERENCES

.1 Execute the cast-in-place structures in accordance with the CSA-A23.1 and A23.3 standards (latest edition).

1.5 CONCRETE QUALITY CONTROL

.1 The Departmental Representative will entrust concrete quality control to a laboratory specialized in this type of work and will pay for all of the expenses related to the inspections and testing.

.2 The laboratory will be the Engineer's representative for everything related to the proportioning of concrete and, as such, will be authorized to issue instructions, which the General Contractor and concrete supplier will follow.

.3 At least three (3) weeks prior to the work, the following will be submitted for approval:

.1 Samples of coarse and fine aggregates;

.2 A copy of the supplier's testing reports, as well as a testing certificate from a qualified independent laboratory confirming that the materials listed below comply with the requirements:

- Portland cement;
- Supplementary cementing materials;
- Additives;
- Aggregates;
- Water;

.3 The concrete proportioning;

.4 The type and brand of the additives.

.4 The laboratory will be notified at least 24 hours in advance of the date and time of each concrete placement.

.5 During each concrete placement, cooperate with the laboratory's staff so that they can monitor the execution appropriately and take the samples required for control and testing.

.6 For each 10 cubic meters of concrete poured in one placement, the laboratory will take a sample of the concrete in order to test the compressive strength at 7 and 28 days, i.e. three (3) standard tubes. The Laboratory will take no less than one sample per day of each class of concrete placed and from each separate element, and no less than three (3) samples per separate type of concrete.

.7 The laboratory will conduct slump and air content tests every time a sample will be taken in order to verify strength and as often as required due to the nature of the structure.

.8 The laboratory will provide relevant instructions regarding concrete placement conditions, protection structures, curing and other installation procedures.

.9 As soon as the tests on the materials will be complete, certified copies of the reports, which will include all of the relevant information, will be sent to the Departmental Representative, the Engineer, the General Contractor and the concrete supplier.

.10 The cost of additional tests in order to verify the strength of the concrete should the formwork be removed early, or for any other specific need required for the work, will be paid by the General Contractor. The Engineer will be informed of any additional testing.

.11 If the tests carried out by the laboratory show that the concrete does not comply with the requirements of the specifications, the cost of any additional verification required by the Engineer and performed by the laboratory, whether related to aggregates, proportioning, mixing at the construction site or at the concrete plant, will be paid by the General Contractor.

.12 Anticipate the need for a sheltered area where the concrete tubes will be stored at the appropriate temperature before they are shipped to the testing laboratory.

Part 2 Products

2.1 MATERIALS

.1 Cement: Cements will comply with the CAN/CSA-A3000 standard (latest edition). Cements will be type 10 or type 10E-SF.

.2 Water: Water will comply with the requirements of the CSA-A23.1 standard (latest edition).

.3 Fine and coarse aggregates: Compliant with the CSA-A23.1 standard (latest edition). In the case of fiber-reinforced concrete, coarse aggregate will be of the "TrapRock" type and meet the requirements of the CSA-A23.1 standard (latest edition). Coarse aggregates will meet the 20-5 mm grade in accordance with the CSA-A23.1 standard (latest edition).

.4 All of the aggregates used in the concrete will not be subject to alkali-aggregate reactions.

.5 The additives used in the concrete will comply with the CSA-A23.1 standard (latest edition).

.6 Non-shrink mortar or grout: premixed product containing natural non-oxidizing aggregates, cement, plasticizer and water reducer. The strength of the grout at 28 days will exceed 50 MPa.

.7 Trial mixes will be prepared before work begins in order to determine the appropriate mixing sequence, as well as the proportions of other additives, and achieve the prescribed mix.

2.2 PROPORTIONING OF CONCRETE

.1 The types of concrete specified below are identical to the concrete required during the construction of the existing water intake and mains.

.2 Type 1 concrete – To fill the trench and concrete banks.

.1 Compressive strength: 35 MPa at 28 days. The water-cement ratio will be lower than 0.45.

.2 Slump:

.1 For a mix without the addition of a superplasticizer at the construction site: between 50 mm and 100 mm.

.2 Adding a superplasticizer to the mix is permitted to achieve a slump higher than 100 mm.

.3 The percentage of air content in fresh concrete will range between 5% and 8%. The air void spacing factor in hardened concrete after placement will be lower than 230 µm and meet the requirements of Article 14.3.3 of the CSA-A23.1 standard (latest edition).

.3 Type 2 concrete – Fiber-reinforced concrete for the water intake's concrete block.

.1 Concrete will contain Portland cement with silica fume (type 10E-SF). Maximum cement content will be 450 kg/m³.

.2 Concrete will contain "TrapRock" type aggregate. The sand/stone volume ratio will be 45/55.

.3 Concrete compressive strength: 50 MPa at 28 days. The water-cement ratio will be lower than 0.40.

.4 Concrete will contain an anti-leaching agent that will optimize resistance to leaching. Resistance to leaching will be lower than 5%.

.5 Concrete slumping to the plastic state at the placement point will be equal to 175 ±40 mm after the addition of a superplasticizer. Slumping will be measured in accordance with the requirements of the CSA-A23.1 standard (latest edition).

.6 Air content in fresh concrete will range between 5% and 8%. The air void factor of the hardened concrete after placement will be lower than 230 µm and meet the requirements of Article 14.3.3 of the CSA-A23.1 standard (latest version).

.7 The concrete mix will include synthetic structural fiber reinforcement (Grace Structural Fiber or equivalent). The quantity of synthetic fiber will be at least 4,6 kg/m³. The fiber will be incorporated to the mix in accordance with the instructions of the manufacturer. The fibers will be at least 50 mm long. Longer mixing time may be required in order to distribute the fiber evenly in the mix.

2.3 ADDITIVES

.1 The use of additives will only be allowed in order to correct a specific deficiency in the mix or to meet concrete placement requirements as recommended by the testing laboratory and with the approval of the Engineer.

.2 Permission to use additives will be denied if, during the work, the setting of the concrete is not satisfactory.

.3 In cold weather, accelerators may be used providing approval is given. In such cases, the use of accelerators will meet the requirements of the CSA-A23.1 standard (latest edition) with regard to concreting in cold temperatures. The use of calcium chloride is not permitted.

.4 In hot weather, set retarders may be used in order to improve the finish, providing that the required approvals are obtained.

2.4 CONCRETE PROCUREMENT

.1 The supplier of ready-mix concrete is responsible for the proportioning of the concrete and will control the quality and consistency of the product at his own expense.

.2 The selection of the concrete supplier is subject to acceptance by the Engineer.

Part 3 Execution

3.1 GENERAL

.1 The Engineer will be notified of the date and time of every concrete placement at least 24 hours in advance.

.2 The framework (anchors) and elements to be incorporated in concrete will not move during the placement of the concrete.

.3 Prior to concrete placement, the General Contractor will make sure that there is no ice on the framework and/or form walls. If there is ice on the framework or form walls, it will be removed with steam or through any other method approved by the Engineer. However, the use of de-icing agents is not permitted.

.4 The General Contractor will make sure that the formwork and form bottoms are clean prior to concrete placement.

.5 A concreting log will be maintained, which will indicate the date and location of each placement, concrete characteristics, ambient air temperature and descriptions of the testing samples taken.

.6 Pumping concrete will be permitted once the materials and concrete mix is approved.

3.2 CONCRETE PREPARATION AND DELIVERY

.1 The concrete will be proportioned and premixed at the plant and delivered at the construction site in mixer trucks that will satisfy the requirements of the CSA-A23.1 standard (latest edition).

.2 Necessary actions will be taken in order to ensure that based on the ambient temperature at the time of concrete placement, the temperature of the concrete will be lower than that which is indicated in Table 16 of the CSA-A23.1 standard (latest edition).

.3 Concrete delivery will be organized and sequenced in such a way as to ensure that concreting is carried out without interruption.

.4 Adding water to the concrete prior to unloading from the mixer truck is not permitted, unless previously authorized by the Engineer. If the addition of water is authorized, the quantity of water added to the concrete will be indicated on the delivery slip.

3.3 CONCRETE PLACEMENT (FILLER CONCRETE)

.1 Place the concrete in cold or hot weather in accordance with the CAN/CSA-A23.1 standard (latest edition). The concrete will be placed in a single continuous operation until the required level is reached. The amount of concrete will allow the completion of each placement without interruption.

.2 The location and size of the sleeves and openings indicated on the drawings will be verified.

.3 Should difficulties arise during the placement of the concrete, the ingredients or proportions of the mix will be modified in accordance with the instructions of the laboratory and additive(s) will be added as instructed by the laboratory at no additional cost to the Client.

.4 If the concrete must be placed in formworks higher than 1.50 meter, an appropriate tube will be used to place the concrete.

.5 Vibration: The General Contractor will vibrate the concrete in order to ensure the proper consolidation of the entire volume of placed concrete.

3.4 CONCRETE PLACEMENT UNDER WATER

.1 Authorization from the Engineer prior to concrete placement is required. The Engineer will also be notified 48 hours prior to concrete placement. The reinforcing steel and any element to be incorporated in the concrete will be placed prior to the verification by the Engineer.

.2 In order for new concrete to adhere properly to existing concrete and anchor rods, contact surfaces will be cleaned immediately before concrete placement. The large deposits will be cleaned with compressed air and water jets.

.3 Concrete placement under water consists in pouring concrete in formwork containing water using a concrete pump connected to a concrete placement tube.

.4 The concrete will contain an anti-leaching agent that will optimize the concrete’s resistance to leaching (less than 5% loss).

.5 Concreting will be carried out in accordance with the requirements of the CSA-A23.1 standard (latest edition). Unless otherwise indicated, tests will be carried out in accordance with the requirements of the CSA-A23.2 standard (latest edition).

.6 The concrete will be placed in a single continuous operation until the required level is reached. The amount of concrete will allow the completion of each placement without interruption and all of the material necessary for the execution of each step of the work will be provided.

.7 Concrete placement under water will be carried out using a pump. Any other means of placement will not be permitted. Concreting with water will meet the following requirements:

.1 Using the concrete pump's discharge hose as a tremie pipe: the diameter of the pump's hose will be at least 75 mm.

.2 Begin to pour the concrete using with a capped tremie pipe filled with concrete and keep the end of the pipe at least 300 mm in the fresh concrete.

.3 If any water infiltrates the pipe, remove the latter immediately. Fill the pipe with concrete and continue placement in accordance with the prescriptions.

.4 If placement is interrupted and a horizontal construction joint is required, the laitance on the concrete's surface will be removed with water jets within 24 to 38 hours. The loose particles will be removed before the next placement.

.5 Concrete placed under water will not be vibrated, disturbed or moved in any way after placement.

.6 Ensure that the concrete in the top section of the formwork has not leached by overflowing the formwork until good quality concrete is obtained.

.7 The General Contractor will make sure that the excess concrete is recovered and that it does not fall in the water. The recovery method will be approved by the Engineer prior to concreting.

3.5 CONCRETE CONSOLIDATION

.1 Concrete consolidation will be carried out in accordance with the CSA-A32.1 standard (latest edition).

.2 An adequate number of approved internal mechanical vibrators will be used.

.3 The vibrators will be handled by experienced operators.

3.6 CURING AND PROTECTION

.1 The concrete will be cured and protected in accordance with the recommendations of the CSA-A23.1 standard (latest edition) while respecting the following requirements.

.2 All of the tools required to cure and protect the concrete will be readily available and ready for use prior to concrete placement.

.3 When the concrete will be sufficiently set, the exposed surfaces will be kept continuously moist for at least seven consecutive days after placement. The water used for hardening will be clean and free of any substance that may stain or discolour the concrete.

.4 Exposed surfaces include the top of the trench and concrete surfaces uncovered after the removal of formworks within seven days following concrete placement. Given the inconvenience of keeping horizontal surfaces wet, a liquid concrete curing compound may

be applied as recommended by the manufacturer. It will be applied consistently, in two consecutive coats, perpendicular from one another, as soon as the concrete will be sufficiently set.

.5 Special precautions will be taken during curing should exceptional conditions occur, such as high temperatures, low relative humidity and strong winds.

.6 Newly placed concrete will be protected from direct sunlight, drying winds, cold, excessive heat and running water with satisfactory tarpaulins or other membrane that will cover or confine the freshly finished concrete surfaces completely until the end of the curing period.

3.7 SURFACE FINISH

.1 The concrete's surface will be broom finished (rough texture), with the exception of concrete blocks, where a smooth finish is required.

3.8 DEFECTIVE CONCRETE

.1 Concrete that will not meet the requirements of the plans and specifications or concrete with apparent surfaces not accepted by the Engineer will be deemed defective.

.2 Repairing the concrete surface will not begin before the Engineer has observed the defect.

.3 Defects that do not affect structural integrity, such as concrete that does not comply with dimensions, details and elevations indicated on the plans, holes from anchors and concrete surfaces with small voids caused by air bubbles or shallow honeycomb patterns:

.1 Localised defects will be repaired in accordance with proven and durable methods and materials providing that the repaired surfaces are and will remain identical to adjacent surfaces.

.2 Sections of structures showing too many defects will be demolished and rebuilt at no cost to the Client.

.4 Concrete with defects that affect structural integrity, such as concrete not strong enough or covered in honeycomb patterns or imperfections that will compromise structural integrity will be demolished and rebuilt at no cost to the client.

.5 Surfaces of apparent repairs will be subject to approval by the Engineer, who may require repairs to representative defects in order to ensure consistency and similitude, as well as the concealment of joints. If repairs are not accepted due to their appearance, the defective sections of concrete will be rebuilt to the satisfaction of the Engineer.

.6 Drippings, streaks and other unsightly irregularities on exposed surfaces will be removed/eliminated within 24 hours after the removal of the formwork.

3.9 ELEMENTS INCORPORATED IN CONCRETE AND OPENINGS

.1 Openings, sleeves, fasteners, anchor bolts and other elements to be incorporated in concrete will be made or placed in accordance with the requirements of the other sections of these specifications. Sleeves, openings, etc., with sides exceeding 100 mm and not indicated in the construction drawings will not be installed or made without authorization from the Engineer.

END OF SECTION

DIVISION 5 – METALS

Part 1 General

1.1 SCOPE OF WORK

.1 Provide all labour and materials to construct and place various metal elements, including access doors.

1.2 REFERENCES

.1 Unless otherwise indicated, CSA W59-1982 “Welded steel construction (metal arc welding)”.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit relevant WHMIS MSDS in accordance with Section 01 33 00 “Submittal Procedures”.

.2 Shop Drawings:

.1 Submit the required drawings in accordance with Section 01 33 00 “Submittal Procedures”.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.21-M81, Grade 300W.

.2 Steel pipe: to ASTM A 53-82 standard weight, galvanized finish.

.3 Stainless steel: ANSI bype 316L.

.4 Structural aluminium: ASTM B-241, 2061.T6 alloy.

.5 Welding materials: to CSA W59-1982.

.6 Bolts and anchor bolts: to ASTM A 307-82a.

.7 Galvanization: hot-dip, with zinc coating 600 g/m^2: to CSA G164-M1981.

.8 Primer applied under shop conditions: to ONGC 1-GP-40M.

.9 Zinc primer: zinc enriched, ready to use: to ONGC 1-GP-181M and to modification dated March 1978.

.10 Sulphur: commercial grade for the installation of metal posts.

.11 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours. Bond strength: 7.9 MPA.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Unless otherwise indicated, fabricate work with steel.

.3 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.4 Where possible, fit and shop assemble work, ready for erection.

.5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 SHOP PAINTING

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.3 Clean surfaces to be field welded; do not paint.

2.4 ACCESS HATCHES

.1 Unless indicated on the plans, all access hatches will be model PTL1050AI, with railing system PTL 070AI, from PRETAL or approved equivalent. They will withstand a minimum load of 485 kg/m^2 (100 lbs/pi^2). Their clear opening will be as indicated on the plans. All access doors will be watertight.

.2 All access hatches will be made of stainless steel.

.3 Each access hatch will include a full frame, pin hinges, spring operators enclosed in telescopic tubes with locks in order to leave the door open, and an automatic lock with fixed handle on the inside, which will be removable from the outside. The top of the hatch will have a rough finish, which will render it non-slip.

.4 Each access hatch will include an integrated, foldable railing, which will be hidden when the access hatch will be closed.

.5 The frame of each hatch will be incorporated in the slab and anchored with C-shaped anchors all around.

Part 3 Execution

3.1 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative, such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Make field connections with bolts to CSA S16S3-1981 or weld field connection.

.5 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.6 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion.

3.2 CLEANING

.1 Clean the metal items after completion of work in order to remove the dust generated by construction or the surroundings.

.2 Upon completion, remove surplus materials, rubbish, tools and fences used to protect the equipment.

END OF SECTION

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

Part 1 General

1.1 RELATED SECTONS

.1 Section 05 50 00 “Metal Fabrications”.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM):

.1 ASTM D 635: Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position;

.2 ASTM E 84: Test for Surface Burning Characteristics of Building Materials;

.3 ASTM D-638: Standard Test Method for Tensile Properties of Plastic;

.4 ASTM D-790: Standard Test Method for Flexural Properties of unreinforced and Reinforced Plastics and Electrical Insulation Materials;

.5 ASTM D-2344: Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

.6 ASTM D-696: Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between −30°C and 30°C with a Vitreous Silica Dilatometer

.7 ASTM E84: Test for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

.1 Data sheets:

.1 Submit the certificates confirming that the expected loads, criteria and flame spread index have been verified by a recognized independent laboratory, in accordance with the prescriptions of section 01 33 00 “Submittal Procedure”.

.2 All products made of fiber-reinforced plastics will be Class 1, with a flame spread index of 25 or less, in accordance with the “tunnel test” of the ASTM E84” standard.

.3 The manufacturer will be certified ISO 9001-2008.

.2 Shop Drawings (PA)

.1 Submit the shop drawings and the list of materials in accordance with the prescriptions of section 01 33 00 “Submittal Procedure”.

.2 The construction details, profile dimensions, cross-sections and component thicknesses, finishes, connections, anchors and accessories will be clearly indicated.

.3 Provide the templates for the anchors and other elements to be installed by others.

.4 Include the elements’ structural strength calculations, materials and other relevant information necessary to perform a structural assessment of the elements, which will meet the specified performance criteria.

1.4 INSPECTION UPON DELIVERY (PS)

.1 The materials and manufactured products will be delivered in their original packaging on undamaged pallets, in packages, containers or in bulk with the manufacturer’s identification tags or stickers. Adhesives, resins, catalysts or sealants will be packaged

separately in identified cardboard boxes in order to facilitate transportation and storage indoors, in a dry and heated location.

.2 All products and materials will be stored separately and handled with care in order to avoid scratches, cracks, chips, distortion and deformations, as well as any other type of damage. The items will be stored in a safe and enclosed area, and not in contact with the ground or water. The adhesives, resins, catalysts and sealants will be stored indoors, in a dry area where the temperature will range between 21 and 29 degrees Celsius until they are used.

1.5 INSTALLATION/IMPLEMENTATION

.1 Inasmuch as possible, pre-assemble the elements under shop conditions in order to reduce the number of connections and avoid assembly on site. The elements will be dismantled only in order to facilitate handling and transportation. Each component will be identified clearly for assembly on site.

1.6 WARRANTY

.1 The manufacturer will provide a 3-year limited warranty against manufacturing defects or non-conformities for all fiber-reinforced plastic products.

Part 2 Products

.1 All of the fiber-reinforced plastic items provided as specified in this section will be made of reinforced fiberglass and quality resin with adequate properties, components, dimensions and in sufficient quantities in order to meet the relevant standards.

2.1 REINFORCED FIBERGLASS

.1 The reinforced fiberglass will consist of a combination of continuous braiding, continuous padded strands, in quantity sufficient and necessary for application and/or will have adequate physical properties.

.2 Flame retardant polyester (ISOFR) “Dynaform” pultruded structural resins (colour: dark grey) will be made by pultrusion. The glass mass will range between 45 and 55%. They will also contain the necessary amount of fiberglass and resin reinforcements needed in the chemical formulation required to provide the necessary corrosion resistance, flame resistance, robustness, strength and other physical characteristics.

.1 The fiberglass reinforcements will be made of a combination of roving, continuous strand mat and surface tissue in quantities sufficient for the required application. Their physical characteristics will also meet the requirements;

.2 Products will be manufactured by:

.1 Fibergrate Composite Structures Inc., from the Stoncor Group, Fibergrate Division or approved equivalent.

.3 All of the surface finishes of the supplied items and fabrication elements will be smooth, resin-rich, without dry or hollow spots, without cracks and will not lack surface reinforcements. All of the fiberglass will be covered in resin in order to protect it against the weather or wear.

.4 All pultruded structural elements will be protected against ultraviolet rays (UV) with:

.1 UV inhibitors incorporated in the resin;

.2 Synthetic surface tissue in order to produce a resin-rich surface.

2.2 ACCESSORIES MATERIALS

.1 Hardware: Stainless steel 316 bolts, screws and washer rings for anchors, spaced as recommended by the manufacturer.

2.3 FABRICATION/SHAPING

.1 Unless otherwise indicated, fabricate the elements with reinforced fiberglass as indicated in the shop drawings and specifications. Respect the specific requirements below.

Part 3 Execution

3.1 PREPARATION

.1 Survey dimensions on site prior to the preparation of the shop drawings and fabrication.

3.2 ASSEMBLY

.1 The formed plastic materials will installed as indicated in the shop drawings and the manufacturer's assembly drawings. Secure and install the fasteners in accordance with the manufacturer's recommendations.

.2 Cuts and openings in fiber-reinforced plastics fabricated on site will be made using diamond or carbon blades and drill bits. Build the metal elements, and make accurate adjustments and joints, as well a tight crossovers.

.3 Seal the openings and cuts in accordance with the manufacturer's instructions. When cutting, drilling or sealing the reinforced fiberglass materials, ensure proper ventilation.

END OF SECTION

DIVISION 15 – MECHANICAL METHOD AND CONTROLS

Part 1 General

1.1 SCOPE OF WORK

.1 This section describes all of the process requirements, as well as the requirements related to the supply and installation of process equipment (pumps, gates, valves, sensors, etc.). The work also relates to all of the equipment, accessories, instruments, piping and valves included in the project.

.2 All of the equipment indicated on the plans will be installed.

.3 The equipment installed will be operational at delivery. The equipment price will include all parts and accessories required for the efficient operation of all of the devices specified.

.4 All connections to existing networks will be included in the contract. The existing piping will be cut/or modified in order to make the connections.

.5 When applicable, the existing facilities will be dismantled to allow the installation of the equipment and piping and then rebuilt to their original state. If cutting pipes is required, the ends of the pipes will be capped.

.6 The openings made to allow the passage of the pipes will be closed.

1.2 GENERAL CONTRACTOR QUALIFICATIONS

.1 The specialized contractor who will execute the work described in this division will hold a license from the “Régie du Bâtiment du Québec” (RBQ) and for the 11.1, 11.2 and 17.1 license sub-categories.

.2 The General Contractor will be responsible for the management of safety at the construction site and will pay special attention to work in confined spaces.

1.3 PROCESS ENGINEERING – CONTROLLING DOCUMENTS

.1 Should there be contradictions between this sections and other equipment-specific sections, the latter will take precedence.

1.4 STRUCTURAL STEEL AND FLOOR ELEVATIONS AND AXIS LOCATIONS

.1 Floor and structural steel elevations indicated on the plans are nominal.

.2 The General Contractor will determine the elevations he deems necessary to perform the work based on official references and markings.

.3 Differences may exist between the actual location of column axis and those indicated on the plans. The General Contractor will therefore verify all measurements against official references and markings.

.4 Claims for additional work as a result of differences between nominal and actual floor and structural steel elevations and between the actual location of the columns and axis and those indicated on the drawings will not be accepted.

1.5 STANDARDS AND REGULATIONS

.1 All materials and equipment will meet the requirements of the latest edition of applicable standards, and more specifically:

.1 Canadian Standards Association (ACNOR);
.2 American Society for Testing Materials (ASTM);
.3 American Gear Manufacturers Association (AGMA);
.4 American Society for Mechanical Engineers (ASME);
.5 Antifriction Bearing Manufacturing Association (ABMA);
.6 Joint Industry Conference (JIC);
.7 Canadian Standard Association (CSA);
.8 American Welding Society (AWS);
.9 American National Standard Institute (ANSI).
.10 American Water Works Association (AWWA)
.11 Canadian Electrical Manufacturers Association (CEMA)
.12 National Electrical Manufacturers Association (NEMA)
.13 American Standard Association (ASA)
.14 Manufacturer's Standardization Board (MSS)
.15 Canadian Government Specifications Board (CGSB)
.16 Standard National Association (SNA)
.17 Instrument Society of America (ISA)
.18 National Sanitation Foundation (NSF).

1.6 WORK INCLUDED

.1 The following (without being limited to) work or structures will be included with the equipment:

.1 Controls;
.2 Couplings and fittings;
.3 All supports, bases, anchors, wedges, shims, bolts, nuts, trims and other devices necessary for the installation of all machinery and equipment.
.4 Grout for machine and equipment bases;
.5 Finishing primer and paint.
.6 Flushing and final oil/grease/lubricants for all of the machinery, pieces of equipment and related lubricating lines, including extensions for lubrication points.
.7 Protective casings for the belts installed on pieces of equipment.
.8 Verification of the alignment of machines or equipment parts aligned in shop and pointed out by the manufacturer prior to the installation of permanent dowels.

1.7 STANDARDIZATION

.1 Special attention will be paid to the standardization of machine components in order to reduce the number of spare parts. The construction materials for each component will be indicated.

1.8 SHIPPING AND HANDLING PREPARATIONS

.1 The equipment will be supported and packed in order to avoid any damage during transportation or unloading.

.2 All machined surfaces will receive a protective coating prior to shipping.

.3 All surfaces will be cleaned and free of any contaminant prior to testing and shipping.

.4 Testing will take place in accordance with the manufacturer's procedures unless otherwise indicated in codes and standards.

.5 The alignment and dimensions of all of the equipment will be verified prior to shipping.

.6 Items requiring lubrication will be protected by a coat of anti-corrosion oil acceptable to the Departmental Representative prior to shipping. These items will be clearly labelled. The label will provide details on the oil and show the following warning: DO NOT OPERATE EQUIPMENT BEFORE IT IS APPROPRIATELY LUBRICATED.

.7 The finished surfaces and assembled parts of the equipment to be shipped will be protected from damage that could occur during handling and transportation.

.8 Bolts of various sizes and categories will be packed separately. The ends of pipes and tubing and the connection devices will be capped or covered for shipping. Small parts will be appropriately packed.

1.9 ELECTRICAL CONNECTIONS

.1 Unless otherwise indicated in this division of the specifications, comply with the requirements of the electricity and control plans, as well as with the provisions of the specification sections pertaining to electricity.

.2 Regarding wiring and connections, the requirements indicated (without being limited to) in the electricity plans will be met. The General Contractor will make the connections to the controllers and equipment.

1.10 SEISMIC PROTECTION MEASURES

.1 Seismic protection devices

Seismic protection devices will be installed in order to comply with the seismic prescriptions of the National Building Code. The devices will comply with current codes and standards, such as SMACNA Seismic Restraint Manual, latest edition. The expert engineer hired by the General Contractor will determine the level of seismic protection required in accordance with SMACNA protection level a, b or c. Plans and specifications stamped and signed by an engineer will describe the seismic protection devices.

The "Régie du bâtiment du Québec" (RBQ) will be provided with a confirmation of compliance regarding seismic protection. This confirmation will be signed by an Engineer registered with the "Ordre des ingénieurs du Québec" (OIQ).

1.11 OPERATIONAL GUARANTEE

.1 The treatment units will be delivered in good condition and will be operational. The General contractor will include in his price all of the parts and accessories necessary for the normal operation of all specified devices and equipment.

1.12 INSTRUCTION MANUALS

.1 The General Contractor will provide three (3) instruction manuals, which will include all of the information received on installation, as well as manufacturers' instructions pertaining to equipment operation and maintenance, as required in section 01 78 00.

Part 2 Products

2.1 SPARE PARTS

.1 The Departmental Representative will be provided with a comprehensive list of spare parts for each type of proposed equipment. This list will include the numbers of the original manufacturers of standardized components.

2.2 BEARING LUBRICATION

.1 Bearings lubricated with oil will be equipped with carters and level indicators. Bearings lubricated with grease will be supplied with grease nipples and extensions, if applicable.

.2 The equipment will be supplied with all roll and plain bearings, etc., which will be lubricated and ready for operation.

.3 All equipment will be adequately protected against oil or grease splashes during normal operation.

2.3 ROTATING PARTS

.1 All equipment with rotating mechanisms, such as belts, pulleys, chains, gears, couplings, etc., will be designed to operate smoothly under loads. The mechanisms that will not be physically encased will be equipped with protection devices that will ensure the safety of the operation and maintenance personnel.

.2 The rotating mechanisms will be selected in accordance with the standards of the AGMA.

2.4 VIBRATIONS

.1 Equipment likely to vibrate the structure or buildings will be provided with anti-vibration devices capable of absorbing the said vibrations.

2.5 NOISE

.1 Unless otherwise indicated in the equipment specifications, the noise level produced during the normal operation of a piece of equipment, measured one (1) meter from said equipment, will not exceed 85 dBa in the expected operation conditions, in accordance with the standards of the International Standard Organisation (ISO), recommendation R 495. If the noise level generated by the equipment exceeds 85 dBa, appropriate corrective actions will be taken.

2.6 BUILDING MATERIALS

.1 Generally speaking, the building materials listed below will comply with the requirements indicated below or be of the same nature, i.e., their properties will be similar to those of the specified materials and, if necessary, be certified (certificate of conformance).

-	Structural steel	ACNOR G40.21M
-	Structural aluminium	ASTM B 241 alloy 6061-T6
-	Ductile cast iron	ASTM A 48
-	Stainless steel	ANSI type 304, 304L or 316.

.2 All contact surfaces between two difference metals will be separated by non-conducting materials if the possibility of a cathodic reaction exists.

2.7 ROLLING AND PLAIN BEARINGS

.1 The L 10 life of any rolling or plain bearing, calculated in accordance with the standards of the AFBMA, will not be less than 100,000 hours.

2.8 CONNECTIONS, PIPING AND VALVES INTEGRATED TO EQUPMENT

.1 The class of the pipes provided will be established by the supplier based on service conditions (temperature, pressures, etc.). However, PVC pipes will not be used if the temperature of the liquid conveyed inside exceeds 25°C.

.2 All of the accessories supplied with the pipes, such as connections, joints, couplings, fittings, rings, sleeves, etc., will be made of the same material as that of the piping to which they will be connected.

.3 Supports, thrust blocks and expansion joints will be included with the pipes that are to be integral parts of the equipment in order to meet the requirements related to the type of pipe supplied and based on the maximum loads that can be withstood.

.4 All of the valves supplied with the equipment will satisfy the requirements of the AWWA or be of similar quality. The manufacturing materials will be specified by the supplier based on the service conditions (temperature, pressures, etc.). All valves with a diameter of 150 mm or more and not motorized and/or automated will be equipped with a geared command mechanism and a hand wheel. Valves with a diameter of 70 mm or less may be screwed on but it will be possible to remove them without dismantling the piping.

2.9 MISCELLANEOUS INSTALLATION MATERIAL

.1 Anchor bolts: with two hexagonal nuts and round washers, in accordance with the ASTM A307-68 standard.

.2 Construction assembly bolts: with a corrosion resistant, semi-finished hexagonal nut and a washer in hardened steel in accordance with the ASTM A307-68 standard. Bolt diameter: 19 mm.

.3 Concrete anchor: HILTI anchor or approved equivalent.

.4 Concrete: 75 mm slump and compressive strength of 20 MPa at 28 days.

.5 Structural steel: elasticity limit of 414 MPa, crenellated steel bars made from steel billets in accordance with the CSA G30.12 standard.

.6 Premixed dry packing product for POR-ROK leveling shims or approved equivalent or grout specified by the manufacturer.

.7 Premixed IN-PAKT grout or approved equivalent.

.8 Joint filler; ETAFOAM or approved equivalent.

.9 Sealant: Dymeric, from TREMCO.

.10 Welding electrodes: compatible with the base metal. The procedure used will comply with the specifications of the CSA W59-1982 standard.

.11 Structural steel will comply with the CSA CAN.3 G40.21-M81 300W standard. The welds will be made by experienced welders who will hold a certificate from the Canadian Welding Bureau.

.12 Steel shims, with parallel faces (do not use corners) approved by the Departmental Representative.

.13 Anti-seize, loctite no. 767 or approved equivalent on the threads of all bolts, cones and nuts installed.

.14 Link Seal sealing rings or approved equivalent for the passage of pipes through existing walls or slabs, with 316 stainless steel nuts and bolts. Use two (2) Link Seal rings to pass each element.

Part 3 Installation

3.1 GENERAL

.1 Regarding overall dimensions and specific installation details, refer to the construction drawings and supplier requirements.

.2 Regarding information on motors and machinery or equipment weights, refer to suppliers' drawings.

.3 Install the equipment and related components in accordance with the instructions of the suppliers and manufacturers.

.4 Contact the other trades in order to coordinate and adapt the work.

.5 All parts and necessary small tasks will be included in installation.

Part 4 Equipment and Piping Finish

4.1 SHOP FINISH

.1 All of the process equipment, as well as the piping and related accessories (connections, flexible joints, and valves) in ferrous metal will receive a surface treatment and a coat of primer under shop conditions.

.2 When the standard description of products or equipment includes a finishing coat, all of the equipment in question will be will be supplied with the said coat.

.3 Surface preparation and the application of primer or finishing coat by the manufacturer under workshop conditions will be compatible with the type of service for which the equipment is intended, as well as the local operation conditions.

.4 Parts or equipment made of bronze, aluminium, stainless steel, plastic or PVC will not be painted. These materials will be cleaned properly after they are manufactured.

.5 Hot-dip galvanizing will be carried out after manufacturing and the zinc coat will be at least 600 g/m^2, in accordance with the CSA G164 standard. Assembly at the construction site will be carried out mechanically. Welding on galvanized steel at the construction site is not permitted.

.6 Pumps, motors and any other equipment and accessories (connections, valves, etc.) will be supplied with the manufacturer's standard finish, providing that the selected protection is of a class that ensures adequate resistance to corrosion for an average duration (between 5 and 10 years) in the conditions that will prevail inside the building, in underground stations or out of doors, whether or not the protection is certified by a manufacturer with at least 5 years of experience in protecting this type of equipment.

.7 At least one coat of zinc-rich primer and two (2) appropriate finishing coats will be applied to stirrups, anchoring devices, supports and parts made of ferrous metal prior to shipment to the construction site, unless they are made of stainless steel, aluminium or galvanized steel.

4.2 ON SITE FINISH

.1 After installation at the site, the piping and related equipment will receive a finishing coat of paint in accordance with the applicable colour code.

.2 The type of paint and the final colour selection will be previously approved by the Departmental Representative.

.3 The number of coats of paint to be applied to the equipment (minimum 2 coats) will cover all of the manufacturer's original paint. The type of paint for the finishing coat will be compatible with the equipment finish applied by the manufacturer.

.4 This application of pain at the site applies to all pipes and cast iron items, valves, connections, flanges, supports, etc.

.5 Items in bronze, aluminium, galvanized steel, stainless steel, plastic and PVC will not be painted. However, this materials will be appropriately cleaned after installation.

.6 Copper pipes will be cleaned with a stripping compound in order to remove all traces of grease and will receive two (2) coats of "URETHANE" varnish, in accordance with the ONGC 1-GP-176b standard. If the surface of the pipe is oxidized, it will be sanded with emery paper in order to restore the initial shine before the application of the varnish.

.7 All aluminium items in contact with concrete will receive a coat of undiluted bituminous paint under workshop conditions, in accordance with the ONGC 1-GP-108M standard, type 1.

.8 Paint damaged where anchors, supports and base plates, etc. have been installed or during equipment transportation or assembly will be touched up. The touch ups will be made with paint identical to that which was originally applied on the equipment, in accordance with the instructions of the suppliers.

Part 5 Equipment Labeling

.1 All of the pieces of equipment, instruments and devices related to process will be clearly and legibly labelled.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 The work described herein includes the supply of material, labour and all that is necessary to install the following equipment or provide the following services (without being limited to):

.1 Pipes, connections, flanges, special accessories, etc.

.2 Trims, water tightening materials, nuts, bolts, etc., required for the complete installation of all of the pipe networks.

.3 Ring seals for pipes passing through floors.

.4 Sleeves for pipes passing through walls.

.5 Connections for instrumentation devices, including nipples and isolation valves or caps, as appropriate, for the installation of the instrumentation devices (the exact location is to be determined on site), as well as the pipes connecting to valves equipped with electric or pneumatic actuators.

.6 Pipes and accessories used as vents for concrete basins and wells.

.7 Miscellaneous cuts and repairs for the installation of the pipe networks.

.8 Required finishing primer and paint.

.9 Paint touch-ups on pipes, where damages incurred as a result of welding, transportation, etc.

.10 All joints.

.11 The design, supply and installation of pipe hangers and anchors, including the various metal fasteners for anchoring to the building's frame.

.12 Concrete bases, grout and anchor bolts for pipe supports installed on floors.

.13 All of the inserts for floor and/or wall openings.

.14 All of the pipes, shown or not on the equipment drawings.

.15 Required connections to existing pipes and equipment, including drains, cuts and pipe removal, temporary caps, blind flanges and other similar devices associated to connections.

.16 Only qualified welders will work on pressurized pipes. Up-to-date records of the qualifications of the welders working at the site will be kept. These records will be available upon request, for verification by the Departmental Representative and/or appropriate authorities.

.17 All of the work required to clean, flush, pressure flush and test the pipes installed, including the installation of blind flanges, pipe sections, temporary pipes and supports, braces and start-up screens for all pumps.

.18 Adequate drainage layouts to remove the water used during testing.

.19 The cleaning, flushing, purging, pressure flushing and testing of pipelines, as well as the cleaning and flushing of all reservoirs and equipment connected to the pipelines.

.20 Records on the commissioning of the pipelines will be kept in accordance with the schedule submitted to the Departmental Representative.

.21 The instrument rings shown on the P&IDs where indicated by the instrumentation contractor.

1.2 CODES AND STANDARDS

.1 The materials, installation and working methods will be in accordance with the latest edition of the following codes, standards and regulations:

.1 ASME B31.1.0, American National Standard Code for Pressure Piping

.2 ASME, Boiler and Pressure Vessel Code; Sections I, II, IV, VIII, Division 1 and 2 and Section IX

.3 ANSI Z49.1, Safety in Welding and Cutting

.4 MSS SP-58, Manufacturers Standardization Society-Standard Practice SP-58

.5 AWS, American Welding Society

.6 ASTM, American Society for Testing and Materials

.7 CSA, Canadian Standards Association

1.3 PIPE IDENTIFICATION

.1 The pipes will be identified in accordance with section 15 10 80 “Networks and Mechanical Devices identification”.

Part 2 Products

2.1 MATERIAL

.1 Pipe specification table

Description	Nominal Diameter	Materials and Connections	Minimum Type / Class
New sea water piping	12 mm to 50 mm	CPV A-1734 glued joint	Schedule 80
New sea water piping	75 mm to 250 mm	PEHD fused joints	DR-11 (160 psi)
Raw sea water piping	12 mm to 50 mm	CPV A-1734 glued joints	Schedule 80
Raw sea water piping	75 mm to 150 mm	PEHD fused joints	DR-11 (160 psi)
Priming system’s vacuum piping	12 mm to 50 mm	CPV A-1734 glued joints	Schedule 80
Service water piping (culture)	12 mm to 50 mm	CPV A-1734 glued joints	Schedule 80
Service water piping (culture)	75 mm to 100 mm	PEHD fused joints	DR-11 (160 psi)

.2 All tightening flanges, hanger assemblies and supports will be as follows:

.1 Pipe flanges tightening:

- IPS schedule: 12 to 300 mm: GRINNELL Fig. 212 or approved equivalent.
- DI thin wall pipe: 38 to 600 mm; manufactured in accordance with the 720-DS-2-8F manufacturing standard.
- Long tangent U-bolt, all sizes: GRINNELL Fig. 137 or approved equivalent.
- Weldless eye nut: GRINNELL Fig. 290 or approved equivalent.
- Turnbuckle: GRINNELL Fig. 230 or approved equivalent.
- Welded eye rod: GRINNELL Fig. 278 or approved equivalent.
- Welded beam attachment: GRINNELL Fig. 66 or approved equivalent.
- Beam clamp: GRINNELL Fig. 131 or approved equivalent.
- Steel washer plate: GRINNELL Fig. 60 or approved equivalent.
- Pipe spacer: GRINNELL series Fig. 160 or approved equivalent.

.2 All materials will be in accordance with the Manufacturers Standardization Society’s “Standard Practice SP-58”.

.3 Unless otherwise indicated in the specifications, all non-submerged supports, hanger rods and clamps will be in mild steel (black steel) in accordance with the ASTM A36 standards. When submerged, they will be in 316L stainless steel.

.4 The metal components for supports, rods and fasteners will be hot dipped galvanized with a zinc coat at least 600 g/m, in accordance with the CSA G164-M1981 standard. The primer will be zinc-rich, ready to use and compliant with the ONGC 1-GP-181M standard, latest edition.

.3 The spacing of the pipe hangers will comply with the recommendations of the pipe manufacturer.

.4 Electric insulation will be applied between the support and the pipe in order to avoid galvanic corrosion.

.5 PVC pipes will not be used if the temperature of the liquid conveyed in the pipe exceeds 55°C.

.6 Insulation inserts will be pre-formed rigid foam glass manufactured under shop conditions, and will be suitable for the thickness of the insulation specified and will include joints with vapour barriers. The lengths will be as follows:

Pipe Diameter (mm)	Length (mm)
38 to 63 mm	250 mm
75 to 150 mm	300 mm
200 to 250 mm	400 mm

2.2 STAINLESS STEEL PIPES

.1 Pipes

.1 Unless otherwise indicated from Table 1, stainless steel pipes will at least comply with the ASTM A 778, type 304L standard. Submerged pipes, and pipes located in environments where the air is humid, will be in stainless steel compliant with the ASTM A 778, type 316L standard.

.2 Pipes, including elbows and other single pieces, will resist a pressure of 1 050 kPa and vacuum.

.3 In necessary, the pipes will be reinforced wherever necessary in order to support the static and dynamic loads.

.4 Elbows 350 mm or less will be pressed and elbows 400 mm or more will be square turned (5 sections for 90° elbows et 3 sections for 45° elbows). Wherever permitted by the configuration, 90° elbows will be long radius elbows.

.5 All of the stainless steel piping specified in the plans will be prefabricated under shop conditions. Fire stops will be made of ASTM A 36 steel.

.2 Tubes

.1 Unless otherwise indicated on the plans, the tubing will have welded stainless steel joints and will at least comply with the ASTM A249/A269 standard.

.2 Tubing, including connections and other single pieces, will resist a pressure of 1 050 kPa and full vacuum.

.3 If necessary, the tubing will be reinforced wherever necessary in order to withstand static and dynamic loads.

.3 Connections

.1 Flanges, removable connections and/or sleeves will be installed wherever shown on the plans and/or required to ensure the piping's flexibility, as well as dismantling and cleaning.

.2 Unless otherwise indicated and generally speaking, the size of the connections will comply with the ANSI B 16.1 standard, class 125.

.3 Pipes connected using VICTAULIC joints (or approved equivalent) will be reinforced using a welded stainless steel 40 pipe section at each thin-walled end in order to make the groove required for this type of joint.

.4 The number of joints, whether rigid or flexible, shown on the plans are a minimum. Fewer joints will not be accepted.

.5 Flange ends 300 mm or less will have 3.2 mm pressed necks. Flange ends 350 mm or more will be rolled angle flanges that will be as thick, or thicker, than the pipe of the same diameter.

.6 When flange joints are used, the flange ends will be rolled Van Stone ends (or approved equivalent). Neck straps will be in ASTM A 36 hot dipped galvanized steel. The flanges' hole pattern will be in accordance with the ANSI B16.5 standard, class 150.

.7 The bolts and nuts will be cadmium-plated and manufactured in accordance with ANSI B18, grade 2 semi-finished UNC series with heavy hexagonal heads. Bolts and nuts submerged or in an environment where the air is humid, e.g. wet wells, basins, etc., will be in stainless steel 316. Full width trims will be in natural red rubber and 3 mm thick.

.8 The end of stainless steel pipes connected to cast iron pipes with a flexible sleeve will be reinforced in order to obtain an exterior diameter compatible with the cast iron pipe.

.9 Compression fittings for tubing:

.1 Tubing connections will be water tight without residual constraints due to torsion.

.2 The connection will withstand pressure equal to that of the burst pressure of the tubing on which they will be installed.

.3 The flow in the tubing will be optimized due to the low distortion of the tubing.

.4 It will be possible to assemble and dis-assemble the tubing repeatedly without altering the quality and effectiveness of the connection.

.5 The connection will be SWAGELOCK or GYROLOCK or approved equivalent.

.4 Welding

.1 The welders will be qualified and hold a permit delivered by the Canadian Welding Bureau or "Travail, emploi et Solidarité sociale" (the Quebec government authority on labour) and as per the requirements of the CSA W47.1 standard.

.2 The welds will be full penetration and free of defects, such as side cuts, porosity, inclusions, exceeding thickness or other defects.

.3 Gas Tungsten Arc Welding (GTAW) with argon protection will be used for the root pass on the opposite side or for welding inside (if accessible), followed by chiseling on the outside until fusion with the inside pass.

.4 Shielded metal arc welding (SMAW) may be used to fill the groove if the joint is in the 1G or 2G welding position and for corner welds.

.5 The amount of heat generated by welding will be kept to a minimum. Oscillation during welding is not permitted.

.6 Oscillation during welding is not permitted. The interpass temperature in the welding area will be less than 350°F (175°C). Heating the solder joint to make corrections or for other purposes is not permitted. The use of other welding methods will require the approval of the Departmental Representative prior to use.

.7 The pipes, supports and other welds will be passivated after installation in accordance with the following method:

.1 Nitric acid 20% to 40%, complemented with water;

.2 Temperature: 55°C-70°C for 30 to 60 minutes;

.3 Hot water wash.

.8 Passivation will be executed with the General Contractor and Departmental Representative in attendance. If not, the General Contractor will be provided with a certificate confirming that the pipes were passivated, which will be presented to the Departmental Representative prior to the delivery of the pipes to the construction site. The supplier may use passivation pastes, if needed. The products used and application methods will require the approval of the Departmental Representative, via the General Contractor.

.9 After the complete installation of the pipes, the welds executed at the site will be passivated and cleaned, then all of the piping will receive a final wash, in accordance with the manufacturer's recommendations.

.10 The welds executed on stainless steel pipes will be X-rayed in order to control quality. A testing report will be provided for approval.

2.3 PVC AND CHLORINATED PVC PIPES

.1 All of the PVC pipes and connections will be schedule 80, in accordance with the CSA B137.3 and ASTM D 1784 standards for type 1, class 1 material and the ASTM D 1785 standard. The pipes and connections will be assembled through solvent bonding using a solvent manufactured in compliance with the ASTM D2564 standard.

.2 All of the PVC pipes and connections will be schedule 80, in accordance with the ASTM D 1784 standard for type 4, class 1 material and the ASTM F 437, F 439 and F 441 standards. The joints will be executed using solvent cement in compliance with the ASTM F 493 standard, such as solvent 724, from Weld-ON or approved equivalent.

.3 All of the pipes will be cylindrical and straight and the ends will be square cut. The finish will be smooth and free of defects, such as grooves or waves.

.4 A sufficient number of box unions will ensure flexibility when dismantling the piping. Unions will be installed for connection to equipment and for each straight pipe more than 7.5 m long.

.5 If there are not enough elbows on long pipe sections to handle thermal expansion and contraction, mechanical expansion joints compatible with the fluid will be used.

.6 If the pipe must be connected to other materials or connections, sleeve adaptors will be used. If VICTAULIC connectors, Dresser connectors, flanges or other connections are used, the recommendations of the manufacturer will be followed to the letter.

.7 Pipe supports will be selected and installed in such a way as not to restrict the movements of the piping caused by thermal expansions.

.8 Standard pipe hangers and supports with large surfaces at the pipe support point and free of sharp edges in contact with the pipes will be used. The hangers will be spaced in accordance with the pipe manufacturer's recommendations for temperatures not exceeding 140°F.

.9 All of the valves and equipment will be supported separately from the pipe. The valves will be anchored in order to avoid transferring the pump's moment of force to the pipe when in operation.

.10 Vertical pipes will be supported under the shoulder of the fitting every 20 feet (6 m).

2.4 FUSED HDPE WATER PIPES

.1 Butt-fused high density polyethylene (HDPE) pipes: minimal class SDR-11, nominal diameter and inside diameter as indicated in the table in section 2.1.1.

.2 When required due to site conditions or requested on the plans, make the connections using flanges provided by the manufacturer (couplings).

.3 When required due to site conditions or requested on the plans, use Frialen electrofusion fittings.

2.5 CLAMPS AND FLANGES

.1 On stainless steel pipes, hot dipped galvanized VICTAULIC series 77 pipe rings (or approved equivalent) that can be adapted to reinforced ends will be used. The pipes will not be grooved in any way. The couplings flanges will be VIC-FLANGE, series 741 or 743 or the approved equivalent.

.2 On class 54 ductile iron pipes, the assembly rings will be VICTAULIC, series 31 (or approved equivalent), which will adapt to grooved joints. The couplings will be VIC-FLANGE, series 341 or 342 or approved equivalent.

.3 Flange adapters for the cast iron sleeves will be UNIFLANGE, model 400-C (class 150) or equivalent approved for low pressure pipe sections (≤ 150 psig).

.4 Flange adapters for cast iron sleeves will be UNIFLANGE, model 420-C (class 300) or equivalent approved for high pressure pipe sections (> 150 psig).

Part 3 Installation

3.1 INSTALLATION TECHNIQUES

.1 The pipes will be installed parallel to walls and buildings, in accordance with accurate lines and elevations, as shown on the construction drawings. Any difference from the dimensions on the drawings will require written acceptance from the Departmental Representative.

3.2 WELDED CONNECTIONS

.1 Welded connections will comply with the prescriptions of section 2.2.4.

3.3 THREADED CONNECTIONS

.1 Threaded joints will comply with the requirements of the standards of the American Standard for Taper Pipe Threads.

.2 The threader used will be new and sufficiently lubricated.

.3 All filings will be removed from the pipes prior to installation.

.4 All of the threads on the pipes will be cleaned in order to remove all oil or grease drippings prior to the application of the thread lubricants specified in the materials classification standards.

.5 Prior to pipe installation, the threads will be coated with a thread sealant paste. This sealant paste will not be accepted as a substitute for a joint inadequately executed. The paste will be applied in such a way as to avoid infiltration inside the pipe.

.6 If Teflon thread seal tape is used, wrapping will begin approximately two threads from the end of the pipe.

.7 The Teflon tape will be wrapped so that it will tighten when the joint is screwed.

.8 It the Teflon tape breaks, all traces of the old tape will be removed before wrapping new tape and making the joint.

.9 Stainless steel pipes will be threaded with threading dies approved for this purpose and accepted by the Departmental Representative. The threader die head will be RIGID, models 47790 and 47785 or approved equivalent. The rotation speed of the threader will be decreased by 50% in order to obtain water tight threads.

3.4 FLANGE CONNECTIONS

.1 Non-metallic trims, with the exception of red rubber, will only be coated with lubricant when specified in the material classification standards or in the manufacturing specifications.

.2 Unless otherwise indicated in the plans, the VAN STONE sealant rings or approved equivalent will be welded perpendicular to the pipes.

.3 Two to four threads will protrude from the flange bolts when tightened.

.4 The bolts will be tightened gradually and evenly so that even pressure will be applied on the trims.

.5 Any drippings from the welding of the flanges connecting the instruments will be removed and the inside of the welds will be grinded smooth.

.6 The inside diameter of the welding neck flange cones to be welded to the end of the instruments' diaphragms will be bored in order to be adaptable to the inside diameter of the pipe.

.7 All of the flanges will be installed perpendicular to the pipe or connection.

.8 Always use new trims, even when the valves have been removed for testing.

3.5 SPECIAL JOINTS

.1 The pipes subjected to important variations in temperature will be equipped with joints that can absorb the heat expansion.

.2 The pipes subjected to heavy vibrations will be equipped with joints capable of absorbing the said vibrations. A flexible EPDM joint will be installed at the PEMN-121 and PEMN-122 pumps outlet port (maximum pressure of 35 psig).

.3 The couplings between different types of pipes will be water tight. In addition, dielectric fittings will be used to isolate two incompatible metals in order to avoid corrosion.

3.6 DETAILED PIPE INSPECTION

.1 Before the isometric drawings for the prefabricated piping are produced, the path of the pipes will be examined in order to identify all interferences, if applicable, with structures, machinery and equipment, supports, pipes, valves and any other obstacle, which will be reported to the Departmental Representative in order to take corrective action, if applicable.

3.7 PIPE BENDING

.1 The pipe bends will be made so that the maximum and minimum diameters are not larger than 5%. They will be without flat surfaces or waves.

.2 Pipes will be cold bent to a radius equal to or smaller than five times the pipe's nominal diameter and will be subjected to treatment in order to release internal stress.

3.8 PIPE SUPPORTS

.1 Any pipe support, rod or fastener will support its portion of the load. The supports will be adjustable so that pipe alignment will be maintained.

.2 All of the anchor bolts and other fasteners will be supplied.

.3 Unless otherwise indicated on the drawings, anchoring and drilling will not be carried out without the approval of the Departmental Representative. In concrete, use HILTI-type anchors or the approved equivalent.

.4 Any contact between dissimilar metals will be avoided through the use of dielectric joints in order to avoid galvanic corrosion. The pipes will be supported and special attention will be paid to the slope required for proper drainage.

.5 The pipes at the pumps' inlet and outlet ports will be supported so that reactions from the piping will not be transferred to the connected equipment.

.6 Pipe supports will be used solely to support pipes. Cable trays, instrument tubing, etc., will be supported by separate support systems unless the General Contractor receives permission from the Departmental Representative to provide other means of support.

.7 Pipe hangers will not go through cable trays for electric cables or instrumentation tubing.

.8 The steel supporting the pipes welded to structural steel **will not be grooved** and all connections will be made with continuous welds.

.9 The welding of the supports will be in accordance with the CSA W59 standard.

.10 For pipes with a diameter of 50 mm or less, self-adhesive PVC tape will be supplied and installed between the pipes and the supports in order to avoid direct contact between the mild steel supports.

.11 The installation of each support will be approved by the Departmental Representative. The latter will be notified when the installation of a support or group of supports will be finished. The Departmental Representative will then inspect the installation and give his approval if he/she is satisfied.

3.9 WATERTIGHTENING AND SLEEVES

.1 Work will be coordinated in order to avoid drilling into the walls or slabs after concreting.

.2 All of the lines passing through the concrete walls of basins containing liquid or sludge will be equipped with an annulus with a continuous weld all around the external perimeter of the pipe's steel bore in order to achieve water tightness. Refer to the detailed figures attached to this section.

.3 If drilling holes in a concrete wall or slab is required for the passage of a pipe, two (2) Link Seal type ring seals (or approved equivalent) with stainless steel 316 nuts and bolts will be used. A finishing grout will be applied to hide the seal on the apparent surface.

3.10 "ARMAFLEX" INSULATION

.1 When indicated on the plans, the pipes and valves will be isolated using "Armaflex" insulation. The joints will be glued using adhesive #520 from Armstrong. Some accessories requiring regular maintenance will not be insulated (coordination will take place at the construction site). All connections will be insulated with the same type of insulation, which will be installed to adjust perfectly to the shape of each connection. For each support, the General Contractor will provide a self-adhesive saddles reinforced with aluminium. The General Contractor will also finish the insulation on each side of the saddle. The insulation thickness required is 25 mm for pipes with diameters larger than 250 mm and 19 mm for pipes with diameters smaller than 250 mm.

Part 4 Testing and Flushing

4.1 GENERAL

.1 The General Contractor will conduct pressure and water tightness tests on all pipes, at his own expense. If some joints or pipes are defective, he will take the necessary actions to repair them and conduct new tests.

.2 Underground pipes will be tested prior to fill work. Pipes to be incorporated in concrete will be tested prior to concrete placement. They will be verified again during start-up.

4.2 TESTING PRESSURES

.1 Unless otherwise indicated, hydrostatic pressure and water tightness tests will be performed on all pipes, with a pressure of 1,050 kPa for 4 hours, under the supervision of the Departmental Representative. For pipes conveying liquid at 160 psi and over and as noted in Table 1 of this section, the pressure for hydrostatic tests will be 1,380 kPa (200 psig). If some joints or pipes are defective, the necessary action will be taken to repair the pipes and new tests will be performed.

.2 The tests will be carried out prior to the installation of the insulation or material used for soundproofing.

4.3 EXCEPTIONS AND MODIFICATIONS

.1 Pipes exposed to the atmosphere

.1 Pressure tests are not required for vents, drains and pipes downstream of relief valves, and for other pipelines exposed to the atmosphere.

.2 The piping used for liquids and exposed to the atmosphere will be filled with water and tested at the maximum static load head.

.2 Hydrostatic tests on pipes connected to equipment

.1 Testing on groups of pipes or networks where equipment is installed will not be permitted if the maximum testing pressure exceeds 1.5 time the design pressure for the equipment when cold.

.2 When the proof pressure of the equipment is lower than the pipe testing pressure, the pipes will either be disconnected from the equipment or they will be isolated using valves or plugs and the equipment will be connected to the atmosphere.

.3 When equipment is not designed to be subjected to comprehensive hydrostatic tests or if the equipment is not to be filled with water, the said equipment will be isolated during the tests and open to the atmosphere.

4.4 PRE-TESTING PREPARATIONS

.1 All vents and other connections that may be used as vents during filling will be open so that air can circulate prior to the pressurization of the network for testing purposes.

.2 When testing will be in progress, all opening plates interfering with filling, ventilation and drainage will be removed.

.3 All special expansion joints that cannot be protected against deformations during testing will be removed or disconnected.

.4 When testing will be in progress, pipelines supported using springs or counterweights will be temporarily blocked in order to withstand the hydrostatic load.

.5 Prior to the pressure tests, all pipelines and/or networks will be inspected in order to ensure that all connected pieces excluded from the tests (such as relief valves, burst discs and other devices) are isolated from the system subjected to tests.

4.5 PROCEDURES

.1 The use of testing inlet covers is permitted during site testing. Any testing inlet cover used for testing at the site during the construction period will be provided by the General Contractor.

.2 The pipes will be tested at the construction site prior to the installation of the soundproofing material. If the latter is installed before testing (except when welds have been tested at the plant or under shop conditions) all connections and welds made at the construction site will remain exposed until testing is complete. When the hydrostatic tests will be complete and the Departmental Representative will have approved the network, all lines and equipment will be drained in order to remove the testing liquid. The network will be vented during drainage to prevent vacuum.

.3 If a line is equipped with back-flow valve, the source of pressure will be upstream of the back-flow valve in order to apply pressure under the valve seat. The drainage point will be downstream of the back-flow valve. If this is not possible, the disc will be removed.

.4 Following the satisfactory execution of the hydrostatic tests, the tasks below will be carried out:

.1 All temporary inlet covers will be removed and the network will be drained;

.2 All valves, orifice plates, expansion joints, small pipe sections and other equipment excluded from the tests will be re-installed;

.3 All of the valves closed exclusively for testing purposes will be opened;

.4 All of the temporary supports will be removed after drainage;

.5 All taps made during testing will be plugged.

4.6 FLUSHING OF THE NETWORK

.1 All water and process pipe networks will be flushed with clean fresh water at a flow rate of 2 m/s. The flow will be maintained for 15 minutes or more, until all impurities are removed from the networks.

.2 The pipes will be cleaned from any debris and left perfectly clean. The pipes will be emptied completely to permit inspection.

.3 When flushing, all of the sediments will be collected in temporary suction filters with #40 mesh screens and fastened with flanges on all pump suctions.

.4 Purge all pipes, including empty pipes, with compressed air or nitrogen without oil. Flow will be sufficient to clean the network thoroughly.

.5 Flushing and purging will be carried out before the installation of command valves and special devices.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 The work described in this section includes the provision of materials, labour and all that is necessary to install the following equipment at the raw sea water pumping station, at the basins in Block D and at the filtered sea water pumping building (new sea water):

- Butterfly valves;
- Ball valves;
- Check valves;
- Miscellaneous accessories;

1.2 GENERAL REQUIREMENTS

.1 Valves of the same type will be provided by the same manufacturer.

.2 In all cases, valves will open counter-clockwise. Generally speaking, there will be a valve at each connection to a main pipe and where instruments or equipment is connected.

.3 All valves where the bottom of the hand wheel or the axis of the double lever will be located 2,000 mm from the floor or more will be equipped with a chain wheel to facilitate operation from the floor level.

.4 All exposed nuts, bolts, springs, washer plates, etc., will be in stainless steel 316.

.5 PVC valves will be made of grade A resin and will meet the requirements of the CSA B137.0 standard with regard to toxicity.

.6 All valves and accessories will have a Canadian Registration Number CRN issued by the “Régie du bâtiment du Québec” (RBQ) in accordance with the CSA B51 standard for pressurized pipes.

1.3 SHOP DRAWINGS

.1 For each valve and related accessories (actuators, etc.), shop drawings will be provided in accordance with 01 33 00, including, among others, the following information:

- Item’s identification number according to plans and specifications;
- Type of valve;
- Make;
- Complete model number;
- Diameter;
- Ambient atmospheric conditions;
- Maximum and downstream pressure;
- Accessory details;
- Notes.

1.4 VALVES TYPES

.1 Based on the use for which the valve is intended, unless otherwise indicated, the valves will be of the type indicated on the plan showing the process diagram.

1.5 IDENTIFICATION OF THE ITEMS

.1 All items will be identified in accordance with the prescriptions of section 15 10 80 “Network and Mechanical Device Identification”.

Part 2 Products

2.1 BUTTERFLY VALVE

.1 The butterfly valves will be type 57 from CHEMLINE or approved equivalent, with PP body and disc. The seat and seals will be from Viton.

.2 The axis of the butterfly valves in the raw sea water pumping station will be in stainless steel 316.

.3 The axis of the submerged butterfly valves in the building where filtered sea water will be pumped will be in titanium.

.4 Butterfly valves with a diameter of 200 mm or less will be equipped with a manual override device with a locking lever. Butterfly valves with a diameter of 250 mm or more will be equipped with hand wheels and gear actuators.

.5 Butterfly valves located more than 1,500 mm from the floor will be equipped with chain wheels and gear actuator for remote operation.

2.2 BALL VALVES

.1 Ball valves will be type 21 from CHEMLINE or approved equivalent, with screwed end double unions, Teflon seat, double Viton water tight seal on the stem and on each side of the ball. The ball with be one with the body when the downstream union will be removed.

.2 The body, the ball and connections will be in PVC, with body in PVDF, except for valves in contact with raw sea water (including drainage and bypass) where the body, ball and connections will be in PVDF with body in PVDF.

.3 Different colour handles will be supplied based on the type of water conveyed in the pipes:

.1 Red for new sea water;
.2 Orange for water with high salt content;
.3 Blue for brine;
.4 White for culture water.

2.3 CHECK VALVES

.1 The check valves will be model SC, Swing Check series, from CHEMLINE and made entirely of PVDF, with Viton water tight seals and flange unions or approved equivalent.

Part 3 Execution

3.1 INSTALLATION

.1 The valves and accessories will be installed in accordance with the manufacturer's recommendations and the details shown on the plans.

.2 All of the tests required to confirm the operation of the equipment will be carried out.

.3 Any defective equipment will be repaired or replaced by the General Contractor. Any system failure will be corrected to the satisfaction of the Departmental Representative.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 The work described in this section includes the provision, installation, configuration, mounting accessories and all other items necessary to install the following equipment at the raw sea water pumping station and at the filtered sea water (new sea water) pumping building:

.1 Pressure gauges;
.2 Ultrasonic level switches;
.3 Air vents with position switches;
.4 Priming valves;
.5 Hose reel;
.6 Miscellaneous small parts necessary to install the equipment listed above;
.7 Equipment commissioning and operator training.

.2 The specialized work included in this section is an integral part of the project.

1.2 OPERATIONAL WARRANTY

.1 All of the equipment delivered will be operational, taking for granted that each unit will be related to other components of Block B and Block D in terms of global operation.

.2 The General Contractor will include in his price all of the parts, pieces of equipment and accessories required for the normal operation of all of the devices specified.

.3 The General Contractor will include in his price the commissioning of all of the equipment, as well as operator training by a qualified technician from the manufacturer.

1.3 PIPES, VALVES AND ACCESSORIES

.1 The work comprised in this section includes all piping, valves and accessories required to supply water to the equipment.

.2 Unless otherwise indicated, the valves and piping required in this section will meet the requirements of the following sections related to process engineering: 15 00 00 “General Requirements”, 15 01 00 “Piping” and 15 01 50 “Valves and Accessories**”.**

1.4 ANCHORS AND SUPPORTS

.1 All bolts, anchors, and other parts and pieces of equipment necessary to anchor the devices and related accessories, as well as the piping, are also included in the work related to this section.

.2 All bolts, anchors, supports and other parts and pieces of equipment used to anchor the devices will be corrosion-resistant, made of stainless steel 316, compatible with the environment where they will be installed and be strong enough ensure adequate anchoring.

Part 2 Equipment

2.1 PRESSURE GAUGES

.1 The pressure gauges will be anti-vibration, model ASHCROFT 1279ASL02L or approved equivalent, with 114 mm dial and 12.7 mm connections. The pressure gauges will be filled with glycerine.

.2 The pressure gauges will be mounted on a stainless steel 306 ASHCROFT 101SS type diaphragm or approve equivalent.

.3 The pressure gauges will be dual scale (psi and kPa) with a level of accuracy of 0.5%. They will be protected against occasional negative pressure that may occur in pipes.

.4 The pressure gauges will be connected to the main pipe via a 12.5 mm shut-off valve, a 12 mm ∅ bleeder valve and a 12 mm connection pipe.

.5 The pressure gauges will be provided with the scales adequate for the application, i.e. with maximum pressure ranging between 50% and 70% of the instrument's full scale.

2.2 ULTRASONIC LEVEL SWITCHES

.1 Ultrasonic level switches will be provided and installed on each of the two (2) sea water pump outlet ports and in the vacuum tank, as indicated on the plans.

.2 The system will be model ECHOTEL 961, from Magnetrol, or approved equivalent. The switch will be in stainless steel 316 with a PVDF coating. Cables will be long enough to connect all of the sensors to the control panel.

2.3 PRIMING AIR VENT WITH POSITION SWITCH

.1 The air vents will be model S-200P 50 mm, from APCO, and equipped with a level indicator made entirely of PVDF (JMG-S-KY, from Jogler), as well as a stainless steel 316 magnetic switch (JS-10, from Jogler) or approved equivalent. The devices will come from the same supplier and will be assembled and tested at the plant. They will operate with a vacuum priming system. All included connect for pipe of culture water, as indicated on the plans.

2.4 PRIMING VALVE

.1 The priming valve will come from the manufacturer of the raw water pumps (see section 15 04 50). They will be equivalent to model GRP33-07, from Gorman-Rupp, and made entirely of stainless steel 316.

2.5 PIVOTING HOSE REEL AND HOSE

.1 One (1) hose reel and hose will be provide at each location indicated on the plans. The hose reels will be used for service water.

.2 The reel will be in stainless steel, with a 5 m hose 12 mm ø, one (1) quick female hose connector and seven (7) quick NPT male connectors 12 mm ø, as indicated on the plans.

Part 3 Commissioning and Training

.1 The General Contractor will conduct operation and capacity tests, and commission the equipment as described in the general administrative clauses.

.2 Training will be provided, as described in section 15 00 00 “Process Requirements”.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 The work described in this section consists in installing raw sea water pumps at the raw sea water pumping station and filtered sea water (new sea water) pumps at the filtered sea water pumping building of the Institut Maurice-Lamontagne. The work includes the following (without being limited to):

- Raw sea water self-priming pumps, including one additional replacement pump;
- Filtered sea water vertical turbine pumps;
- Motors and couplings;
- Bases;
- All of the accessories and supports required for the complete, safe and operational installation of the equipment;
- Calibration and tests required with the pump suppliers in attendance;
- Operator training.

.2 The manufacturer will provide pump curves for each pump. These hydraulic curves will meet the operational conditions specified in the “HI level A” standard.

.3 The specialized work described in this section is an integral part of the project.

1.2 OPERATION WARRANTY

.1 All of the equipment delivered will be operational, taking for granted that each unit will be related to the other components of the salinity control system in terms of global operation.

.2 The General Contractor will include in his price all of the parts and accessories necessary for the normal operation of all of the pieces of equipment specified.

1.3 PIPES, VALVES AND ACCESSORIES

.1 The work described in this section includes all piping, valves and accessories required to supply the equipment with water.

.2 Unless otherwise indicated, the valves and pipes required in this section will meet the requirements of the following process engineering sections: 15 00 00 “General Requirements”, 15 01 00 “Piping” and 15 01 50 “Valves and Accessories”.

1.4 ANCHORS AND SUPPORTS

.1 All of the bolts, anchors, supports and other parts or pieces of equipment necessary to anchor the equipment and their accessories, as well as pipes, are included in the work described in this section. The concrete bases under the pumps and pipes where required on the plans and/or trade practices are also included.

.2 All of the bolts, anchors, supports and other parts or pieces of equipment used to fasten the equipment will be corrosion-resistant, in stainless steel 316, compatible with the environment where they will be installed and be strong enough to ensure adequate anchoring.

Part 2 Equipment

2.1 SELF-PRIMING PUMPS AND MOTORS (RAW SEA WATER)

.1 Self-priming centrifugal pumps mounted on bases will be magnetic drive pumps. The body of the pump will be made of ductile cast iron, coated with at least 3 mm of fused polymer.

.2 The impeller and shaft will be made of steel.

.3 The seal will be compatible with the other materials of the pump in terms of corrosion resistance and wear. The supplier of the pump will be solely responsible for the installation and performance of all seals and joints.

.4 Each pump will have a drainage opening.

.5 All of the pumps will be equipped with a metal base and guardrail. The pump and the motor will be installed on the base at the supplier's facilities. The base will be rigid, with threaded fasteners and openings in which concrete will be poured. The dimensions of the entire apparatus will be approved by the engineer.

.6 The centrifugal pumps will have a capacity of 220 GUSPM at 35psi for a NPSH minus or equal to 5 feet and will be model T3A60S-B/F 3x3 with flange from Gorman-Rupp. They will handle solids of 63.5 mm. The pumps will be supplied by John Brooks Ltd.

.7 The motors will be totally enclosed and fan-cooled (TEFC).

.8 The motor's capacity will be sufficient to operate within the entire range of the performance curve without overheating, i.e. without exceeding the nominal capacity, excluding the service factor for the isolation class specified.

.9 The motors will be high-efficiency, 15 HP at 1,800 rpm, for electric power supply 575/3/60 and will be inverter duty for operation at variable speeds.

.10 The motors will be designed and manufactured in accordance with the latest editions of the CSA and NEMA standards, and will have a continuous service factor that will allow a continuous 15 % overload at the shaft. Insulation and winding will be Class B.

.11 The motors will be designed for continuous service at nominal capacity without exceeding the temperature rating point of 40°C, in accordance with the prescriptions of the AMEEC standards.

.12 The maximum number of starts per hour will be in accordance with the AMEEC standards. The equipment will re-started without exceeding the maximum design temperature.

.13 The motor housing will be labelled and controlled by a recognized organisation, such as the Underwriters Laboratories of Canada, CSA or the Canadian Electrical Code with Québec amendments.

.14 The installation of the pumps and related motors, as well as the alignment and couplings, will be performed in conformity with the manufacturer's instructions.

.15 Each motor will have its junction box and all alarm signals will be wired to it.

.16 The motors will be Premium Efficiency Motors.

2.2 VERTICAL TURBINE PUMPS AND MOTORS (FILTERED SEA WATER)

.1 For each vertical turbine pump, the General Contractor will supply and install one (1) water lubricating system for the shaft and column.

.2 Each impeller's flow straightener will be in stainless steel 316 with glass on the inside. The impellers will be in stainless steel 316 and equipped with a wear ring. The pump's shaft will be in stainless steel 316 and mechanically sealed.

.3 The pump's column will be in stainless steel 316 with flange connections that can be disassembled in lengths of 1.2 m.

.4 The transmission shaft will be in stainless steel 316 and provided in lengths of 1.2 m. The shaft's bearings will be in neoprene and supported by stainless steel 316 cross-braces. The maximum deflection allowed is .003 mils.

.5 The pump's head will be in stainless steel 316, with ANSI class 150 flange connections, unless otherwise indicated in the table below. It will be fastened to a steel support plate coated with 25 mm of epoxy. The plate will be bolted to the concrete base with four (4) 25 mm ∅ bolts. The bolts will be anchored to the slab.

.6 The size and capacity of the supporting base plate will suffice to support the entire weight of the suspended parts, plus the hydraulic load, and include a good safety margin.

.7 The size of the bolts for the supporting base plate will suffice to support the suspended equipment safely during the pump's installation or repairs.

.8 The pump's suction will be equipped with a basket-type stainless steel 316 strainer.

.9 The pumps will have the following special features:

	Filtered Sea Water Pumping Facility
Make and Model	SH10C-3 de SIMFLO, EC-2359 de Flow Serve or approved equivalent
Model	SH10C-3
Capacity	28L/s @ 45 m (450 USGPM at 155 ft)
Number of stages	3
Length of column section (mm)	1,219 mm (48 inches) maximum
Junction type	Flange
Shaft diameter (inches)	1
Type of water tight casing (psig)	400
Speed (RPM)	1800
Motor (HP)	30
Variable speed (inverter duty motor)	Yes
Winding thermistor	No

	Filtered Sea Water Pumping Facility
Column (mm)	150
Efficiency	88,5%
Connection flange	250 # FF
Discharge (mm)	150
Number of pumps to supply	4

Part 3 Motors

3.1 VERTICAL TURBINE PUMP MOTOR

.1 The main electric motor will be vertical with a hollow shaft, high efficiency, protected against the weather, induction-type, squirrel-cage, make: US MOTOR, Emerson (or approved equivalent).

.2 The motor will meet the requirements of the CEMA standard. It will be designed based on a continuous service factor that will allow a 15% overload when stopping. The isolation will be Class B and of the best quality, which will allow an increase in temperature of 90°C above the temperature rating point of 40°C. The motor will be equipped with a non-reverse ratchet.

.3 The motor will operate on Hydro-Québec's power network at 600 volts, ±10%.

.4 The following table lists the characteristics of the electric motors:

	Filtered Sea Water Pumping Facility
Power (HP)	30
Supply	575 V, 3 ø, 60Hz
Speed	1,800
Winding thermistor	No

.5 Motors that will not be required to operate at variable speeds will be designed to start with "soft-start / soft-stop" electronic semiconductor motor controllers.

.6 Motors that will be required to operate at variable speeds will be inverter duty.

.7 The General Contractor will verify pump vibrations with the pump supplier in attendance.

3.2 PUMPS AND SPARE PARTS

.1 A replacement raw sea water pump and a complete set of spare parts, including an O-ring, seals of every type (for the nose piece, for the impeller at the shaft sleeve, for the impeller bolt, for the volute, etc.) and a mechanical seal will be supplied.

Part 4 Commissioning and Training

.1 The General Contractor will carry out operational and capacity tests, as well as the commissioning of the equipment with the pump suppliers in attendance, as required by the general administrative clauses. Specifically, the General Contractor will carry oout all

commissioning activities for all of the pumps. He will also plan one day of work for the control panel supplier in order to:

.1 Adjust the overload relays;

.2 Verify all cables and wires;

.3 Start and adjust the pumps;

.4 Render the system fully operational.

.2 One day of training will be provided as indicated in section 15 00 00 “Process Requirements”.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 All of the pieces of equipment related to process systems, as well as the pipes, will be identified.

.2 The General Contractor will submit a diagram of the equipment, which will include the identification, name and number that he plans to use, to the Departmental Representative for verification.

.3 This identification (name and number) will be consistent everywhere, on the plans, instrument and control panels and in the operation manuals.

.4 The identification plates, bands and tags will be visible and will not be covered with pain or other material.

.5 Where insulation is required, the insulation will be identified.

Part 2 System Identification

2.1 EQUIPMENT IDENTIFICATION

.1 The manufacturer's identification plates will be attached to the equipment. These plates will show the manufacturer's name, model, serial number and, depending on the type of equipment, engine power, the type of electrical power supply, the unit's capacity and all other relevant information.

.2 In addition to the manufacturer's identification plates, all of the equipment, such as pumps, boosters, blowers, tanks, etc., will be identified using tags attached to each of the said equipment with brass chains. The tags will be made of fiberglass or laminated, 65 mm x 100 mm, black on yellow, with black lettering at least 12 mm high. The tags and chains will be made by W.H. Bradly Inc. or approved equivalent. The type and number of the equipment will appear, e.g. BOOST-01 for booster #01, and will match the identification nomenclature indicated on the plans, instrument and control panels and attached to starters, switches, etc.

2.2 PIPE IDENTIFICATION

.1 The General Contractor will identify all of the pipes, including HDPE, stainless steel and PVC pipes, with yellow adhesive bands on which black lettering and arrows will appear and indicate the nature of the product conveyed in the pipes (brine, new sea water, water with a high salt content, etc.), as well as the direction of the flow.

.2 The identification bands will be installed on the pipes at regular intervals of no more than cinq (5) metres, in order to alternate complete identification (lettering and arrows) with arrows only.

.3 At strategic locations (valves, tees, crosses, passage through wall or floors, etc.), additional identification will be provided, i.e. the source and destination of the product transported in accordance with the figures attached to this section.

.4 The identification bands will be of type B-500 or B-350, from W.H. Bradly Inc. or approved equivalent (Signis, ID Group, Vision Marker A.P. Inc.). The style of the identification bands will be approved based on the outside diameter of the pipe to identify.

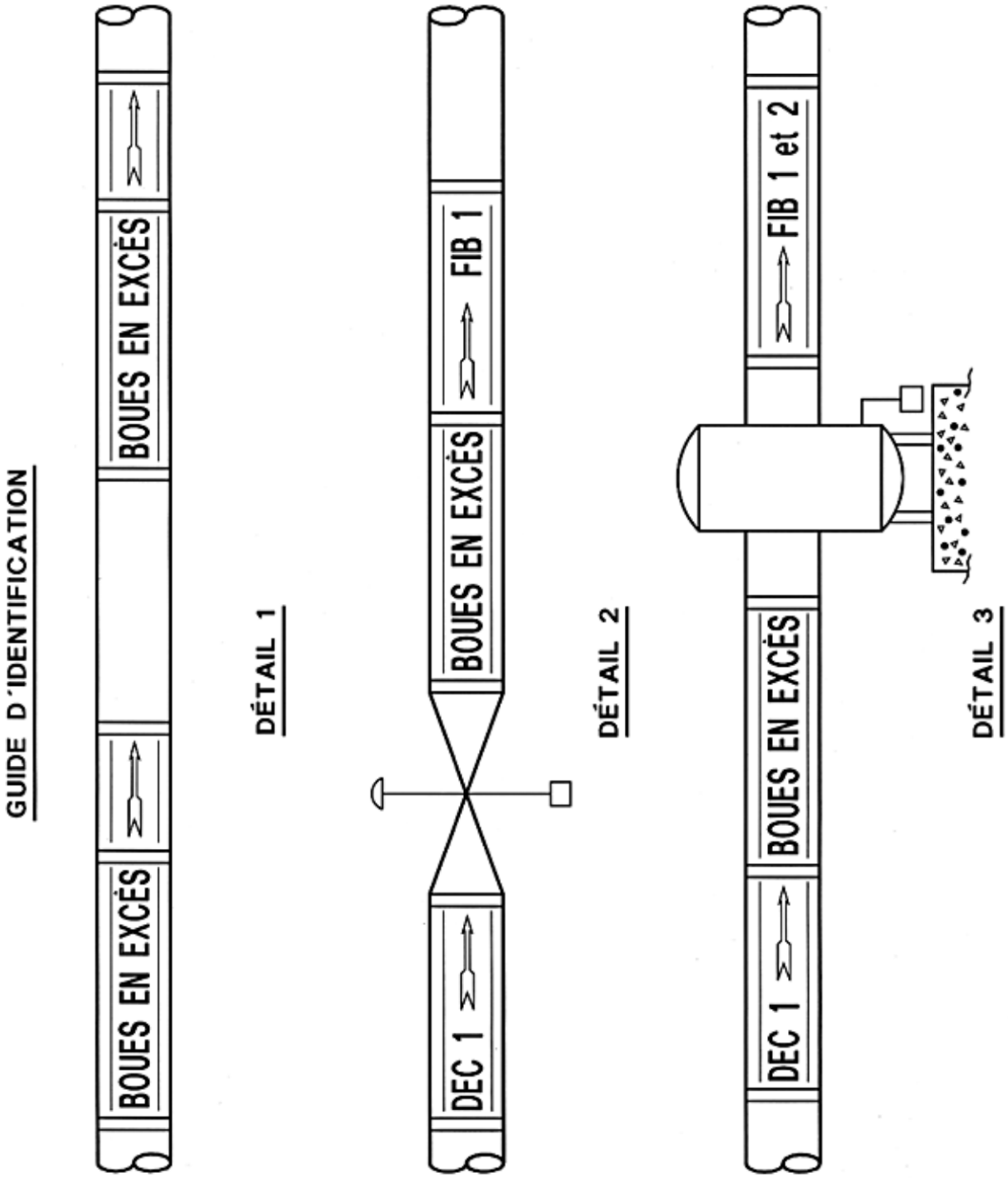
2.3 VALVE IDENTIFICATION

.1 The General Contractor will identify all of the valves with the same tags and chains and in the same consistent manner as for the other equipment, as described in article 2.1 of this section.

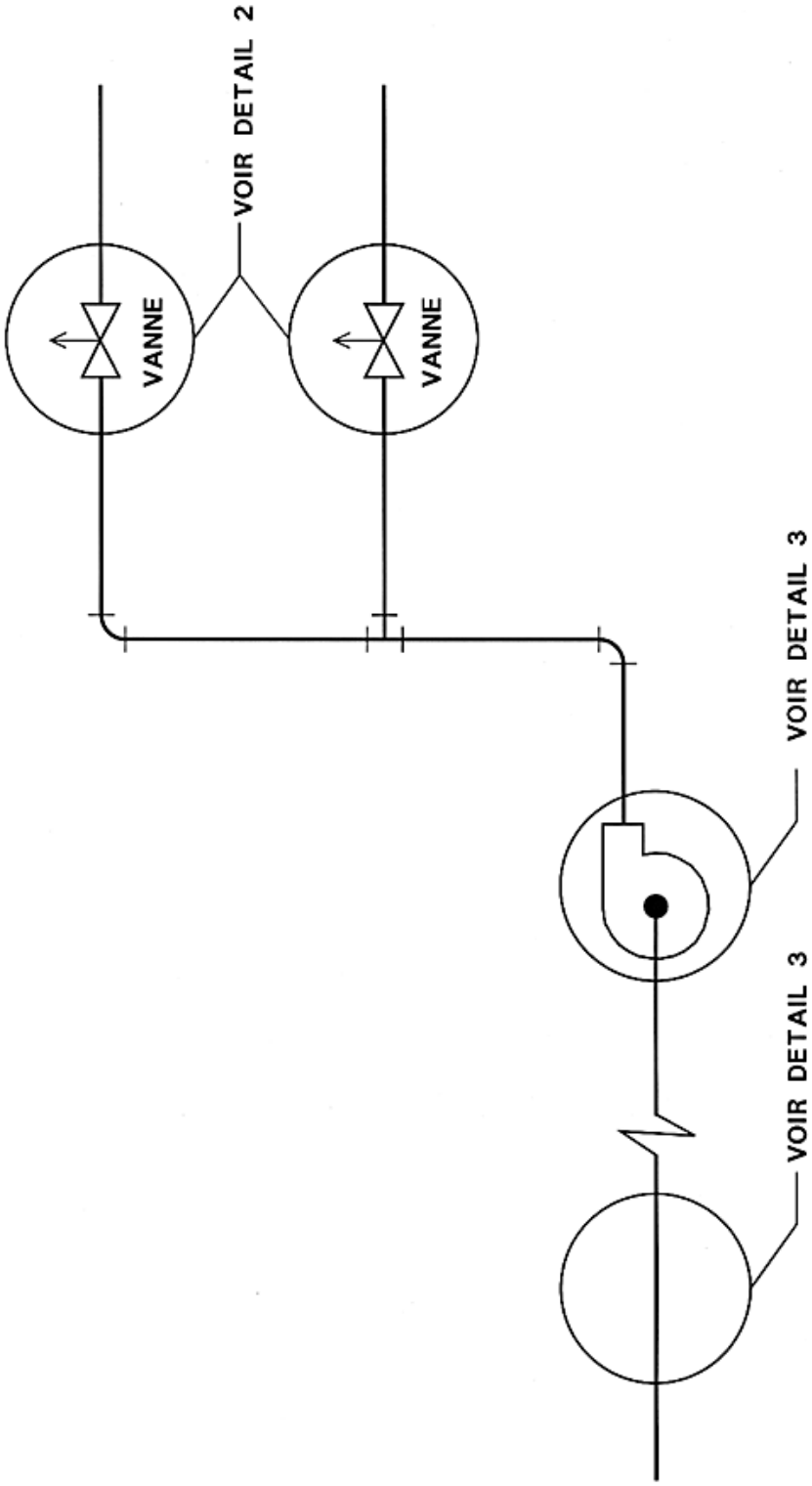
2.4 COLOUR CODE

.1 Paint will be provided and applied on pipes, with the exception of stainless steel, PVC and CPVC pipes, air ducts, mechanical and electrical devices, process devices (motors and pumps), in accordance with the colour code below:

Drinking water:	Light blue, Sico #3027-41 (or equivalent)
Non-potable service water:	Dark blue, Sico #SM-820 (or equivalent) with “Non-potable Water” tag
Hot service water:	Medium blue, Sico #3028-32 (or equivalent)
Raw wastewater:	Grey, Sico #SM-1008 (or equivalent)
Process compressed air:	Light green, Sico #SM-986 (or equivalent)
Control compressed air:	Dark green, Sico #SQ-6741 (or equivalent)
Alum:	White, Sico #SM-833 (or equivalent)
Ventilation duct:	Pale grey, Sico #3215-31 (or equivalent)
Pre-painted electric panels:	Plant colour
Supports:	Same colour as the equipment or underlying surface.
Emergency equipment:	Red, Sico #SM-736 (or equivalent)
Valves, etc.:	Same colour as the underlying pipe.


GUIDE D'IDENTIFICATION
BOUES EN EXCÈS
BOUES EN EXCÈS
DÉTAIL 1
DEC 1
BOUES EN EXCÈS
FIB 1
DÉTAIL 2
DEC 1
BOUES EN EXCÈS
FIB 1 et 2
DÉTAIL 3

EXEMPLE D´INSTALLATION



END OF SECTION

DIVISION 22 – PLUMBING

Part 1 General

1.1 GENERAL

.1 The work will take place in the existing Block D building of the Institut Maurice-Lamontagne. Operation and activities will be maintained for the entire duration of the work.

1.2 SCOPE OF WORK

.1 Dismantle the equipment as indicated on the plans. The openings resulting from the dismantling of the pipes will be capped.

.2 Provide and install the equipment indicated on the plans.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The General Contractor will visit the site in order to properly assess the scope of the demolition work.

.2 Dismantle the equipment as indicated on the plans.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 01 00 10 – General Instructions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings to show:
.1 Mounting arrangements.

.3 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

Part 1 General

1.1 GENERAL

.1 The work will take place in the existing Block B and Block D buildings of the Institut Maurice-Lamontagne. Operation and activity will be maintained during construction.

1.2 SCOPE OF WORK

.1 The ventilation equipment indicated on the plans will be dismantled.

.2 A new ventilation system will be installed and all of the tasks related to the balancing of the system will be carried out, as indicated on the plans.

.3 The balancing of the Vent-B2-A1 / Vent-B2-R1 systems will be performed as indicated on the plans.

.4 Controls related to process engineering will be modified as indicated on the plans.

.5 All complementary work not specifically indicated, but necessary for the completion of the work described in the plans and specifications, will be carried out.

.6 All of the balancing tasks will be carried out by a contractor specialized in this field, under the responsibility of the ventilation contractor.

.7 Control-related work will be carried out by a contractor specialized in thia field, under the responsibility of the General Contractor. The work will be performed by Siemens (existing centralisation at the site). Other companies will not be accepted.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The General Contractor will tour the site in order to fully assess the scope of the demolition work required.

.2 All of the ventilation ducts, equipment and accessories will be removed as indicated on the plans.

.3 The General Contractor will remove all of the dismantled material from the site.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 01 00 10 – General Instructions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section [01 33 00 - Submittal Procedures].

.2 Shop drawings to show:
- .1 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:
- .1 Acoustical sound power data, where applicable.
- .2 Points of operation on performance curves.
- .3 Manufacturer to certify current model production.
- .4 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section [01 33 00 - Submittal Procedures]: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.5 Closeout Submittals:
- .1 Provide operation and maintenance data for incorporation into manual specified in Section [01 78 00 - Closeout Submittals].
- .2 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls.
  - .2 Description of systems and their controls.
  - .3 Description of operation of systems.
  - .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Special performance data as specified.
  - .4 Testing, adjusting and balancing reports as specified in Section [23 05 93 - Testing, Adjusting and Balancing for HVAC].
- .6 Approvals:
  - .1 Submit [2] copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted.
  - .2 Make changes as required and re-submit as directed by Consultant.

- .7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.6 Site records:

.1 Provide sets of prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information to sets of prints, revising to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.7 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

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

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed as-built drawings with Operating and Maintenance Manuals.

.8 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section [01 45 00 - Quality Control].

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section [01 35 29.06 - Health and Safety Requirements].

1.4 MAINTENANCE

.1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section [01 78 00 - Closeout Submittals].

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal].

Part 3 Execution

3.1 CLEANING

.1 Clean interior and exterior of all systems. Vacuum interior of ductwork and fans.

3.2 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests in accordance with Section [01 45 00 - Quality Control] and submit report as described in PART 1 - SUBMITTALS.

3.3 DEMONSTRATION

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Use operation and maintenance manual and as-built drawings.

3.4 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Electrical motors, drives and guards for mechanical equipment and systems.
- .2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.

.2 Related Requirements
- .1 Division 01 00 10 - General Instructions.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
- .1 ASHRAE 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals
- .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with applicable Provincial /Territorial regulations.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 GENERAL

.1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 373 W 1/2 HP: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.3 Motors 373 W 1/2 HP and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 degrees C, 3 phase, 600 V, unless otherwise indicated.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Consultant for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 7.5 kW 10 HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 For motors 7.5 kW 10 HP and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

.8 Supply one set of spare belts for each set installed in accordance with Section 01 78 00 - Closeout Submittals.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;
- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
- .3 38 mm dia holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension. -

.5 Guard for flexible coupling:
- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:
- .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

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 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME B31.1-07, Power Piping.

.2 ASTM International
- .1 ASTM A 125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A 563-07a, Standard Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

.4 Underwriter's Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:
- .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Manufacturers' Instructions:
- .1 Provide manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

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

.3 Packaging Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Produts

2.1 SYSTEM DESCRIPTION

.1 Design Requirements:
- .1 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP 58.
- .2 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .3 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into connected equipment.
- .4 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

.2 Performance Requirements:
- .1 Design supports, platforms, catwalks, hangers to withstand seismic events as specified Section 23 05 48 – Vibration and seismic controls for HVAC piping and equipment.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP 58. ANSI B31.1 and

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 50 00 – Metal Fabrications. Submit calculations with shop drawings.

2.4 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 50 00 – Metal Fabrications.

.2 Submit structural calculations with shop drawings.

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 in accordance with:
.1 Manufacturer's instructions and recommendations.

.2 Clevis plates:
.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.3 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.3 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.4 FINAL ADJUSTMENT

.1 Adjust hangers and supports:
.1 Ensure that rod is vertical under operating conditions.
.2 Equalize loads.

.2 Adjustable clevis:
.1 Tighten hanger load nut securely to ensure proper hanger performance.
.2 Tighten upper nut after adjustment.

.3 C-clamps:
.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:
.1 Hammer jaw firmly against underside of beam.

3.5 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

3.6 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Vibration isolation materials and components, seismic control measures and their installation.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.2 National Building Code of Canada (NBC) - 2010

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .2 Provide system shop drawings complete with performance and product data.
- .3 Provide detailed drawings of seismic control measures for equipment.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.
- .3 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation as indicated.

2.2 ELASTOMERIC PADS

.1 Type EP1 - neoprene waffle or ribbed; 9 mm minimum thick; 50 durometer; maximum loading 350 kPa.

.2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.

.3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.

.4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

.1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

2.4 SPRINGS

.1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.

.2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.

.3 Cadmium plate for outdoor 100% relative humidity installations.

.4 Colour code springs.

2.5 SPRING MOUNT

.1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.

.2 Type M2 - stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.

.3 Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.

.4 Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer

plates.

.5 Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg maximum.

2.6 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.

.3 Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.

.4 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.

.5 Type H4 - stable spring, elastomeric element with precompression washer and nut with deflection indicator.

2.7 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

.1 Acoustic barriers: between pipe and support, consisting of 25 mm minimum thick heavy duty duck and neoprene isolation material.

2.8 HORIZONTAL THRUST RESTRAINT

.1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.

.2 Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

2.9 SEISMIC CONTROL MEASURES

.1 General:
- .1 Following systems and/or equipment to remain operational during and after earthquakes:
  - .1 System 1-VE-01.
- .2 Seismic control systems to work in every direction.
- .3 Fasteners and attachment points to resist same maximum load as seismic restraint.
- .4 Drilled or power driven anchors and fasteners not permitted.
- .5 No equipment, equipment supports or mounts to fail before failure of structure.
- .6 Supports of cast iron or threaded pipe not permitted.
- .7 Seismic control measures not to interfere with integrity of firestopping.

.2 Static equipment:
- .1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
- .2 Suspended equipment:
  - .1 Use one or more of following methods depending upon site conditions

and/or as indicated:
.1 Install tight to structure.
.2 Cross brace in every direction.
.3 Brace back to structure.
.4 Cable restraint system.

.3 Seismic restraints:
.1 Cushioning action gentle and steady.
.2 Never reach metal-like stiffness.

.3 Vibration isolated equipment:
.1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.
.2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.
.3 As indicated.

.4 Bracing methods:
.1 Structural angles or channels.
.2 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

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 Seismic control measures to meet requirements of NBC.

.2 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.3 Ensure, ducting to isolated equipment do not reduce system flexibility and that ducting passage through walls and floors do not transmit vibrations.

.4 Where isolation is bolted to floor use vibration isolation rubber washers.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
.2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:

.1 After delivery and storage of Products.
.2 After preparatory work is complete but before installation commences.
.3 Twice during the installation, at 25% and 60% completion stages.
.4 Upon completion of installation.

.3 Submit manufacturer's reports to Consultant within 3 days of manufacturer representative's review.

.4 Make adjustments and corrections in accordance with written report.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
- .2 Sustainable requirements for construction and verification.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
- .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product data to include paint colour chips, other products specified in this section.

.3 Samples:
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.2 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Dispose of unused paint and coating material at official hazardous material

collections site approved by Consultant.

.3 Do not dispose of unused paint and coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
- .1 Equipment: manufacturer's name, model, size, serial number, capacity.
- .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
- .1 Hazardous: red letters, white background.
- .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
- .1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
- .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.

.4 Locations:
- .1 Terminal cabinets, control panels: use size # 5.
- .2 Equipment in Mechanical Rooms: use size # 9.

.5 Identification for PWGSC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.
.2 Equipment in Mechanical Room:
  .1 Main identifier: size #9.
  .2 Source and Destination identifiers: size #6.
  .3 Terminal cabinets, control panels: size #5.
.3 Equipment elsewhere: sizes as appropriate.

2.3 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.4 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.5 LANGUAGE

.1 Identification in English and French.

.2 Use one nameplate and label for both languages.

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 TIMING

.1 Provide identification only after painting specified Section 09 91 23 - Interior Painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Identify systems, equipment to conform to PWGSC PMSS.

3.4 NAMEPLATES

.1 Locations:
  .1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON DUCTWORK SYSTEMS

.2 Adjacent to each change in direction.

.3 At least once in each small room through which ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.7 At beginning and end points of each run and at each piece of equipment in run.

.9 Identification easily and accurately readable from usual operating areas and from access points.
.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Consultant within 20 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

- .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.
- .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
- .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

- .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
- .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Consultant in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.9 START OF TAB

.1 Notify Consultant 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Application of weatherstripping, sealing, and caulking.

.4 Pressure, leakage, other tests specified elsewhere Division 23.

.5 Provisions for TAB installed and operational.

.6 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
- .1 Proper thermal overload protection in place for electrical equipment.
- .2 Air systems:
  - .1 Filters in place, clean.
  - .2 Duct systems clean.
  - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
  - .4 Correct fan rotation.
  - .5 Fire, smoke, volume control dampers installed and open.
  - .6 Coil fins combed, clean.
  - .7 Access doors, installed, closed.
  - .8 Outlets installed, volume control dampers open.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:
- .2 HVAC systems: plus 5%, minus 5%.

1.11 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

.1 Prior to TAB, submit to Consultant list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

1.13 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
- .1 Details of instruments used.
- .2 Details of TAB procedures employed.
- .3 Calculations procedures.
- .4 Summaries.

1.15 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:
- .1 Project record drawings.
- .2 System schematics.

.3 Submit 6 copies of TAB Report to Consultant for verification and approval, in both official languages in D-ring binders, complete with index tabs.

1.16 SETTINGS

.1 After TAB is completed to satisfaction of Consultant, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.17 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Consultant.

1.18 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section and TAB standards of AABC, NEBB, SMACNA and ASHRAE.

.2 Do TAB of systems, equipment, components, controls specified Division 23 following systems, equipment, components, controls :
- .1 System 1-VE-01.
- .2 System Vent-B2-A1 / Vent-B2-R1.

.3 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB and qualified to standards of AABC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.

.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: to include as appropriate:
- .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
- .2 At controllers, controlled device.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.
- .2 Sustainable requirements for construction and verification.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 480/A 480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .2 ASTM A 635/A 635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
- .3 ASTM A 653/A 653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33 .

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.
- .2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.
- .3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

.6 Transport Canada (TC).
- .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:
- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Waste Management and Disposal:
.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
.4 Separate for recycling in designated containers Steel, Metal ans Plastic waste in accordance with Waste Management Plan.
.5 Place materials defined as hazardous or toxic in designated containers.
.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed

.2 Seal classification:
.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant tape or combination thereof.
.3 Class C: transverse joints and connections made air tight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.
.4 Unsealed seams and joints.

2.2 SEALANT

.1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.
- .1 Rectangular: standard radius or short radius with double thickness turning vanes Centreline radius: 1.5 times width of duct.
- .2 Round: smooth radius five piece. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:
- .1 To 400 mm: with double thickness turning vanes.
- .2 Over 400 mm: with double thickness turning vanes.

.4 Transitions:
- .1 Diverging: 20 degrees maximum included angle.
- .2 Converging: 30 degrees maximum included angle.

2.6 STAINLESS STEEL

.1 To ASTM A 480/A 480M, Type 316.

.2 Finish: No. 4.

.3 Thickness, fabrication and reinforcement: to ASHRAE ans SMACNA.

.4 Joints: to ASHRAE and SMACNA be continuous inert gas welded.

2.7 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
  - .1 Maximum size duct supported by strap hanger: 500.
- .2 Hanger configuration: to ASHRAE and SMACNA.
- .3 Hangers: black stainless galvanized steel angle with stainless steel rods to ASHRAE and SMACNA:
- .4 Upper hanger attachments:
  - .1 For concrete: manufactured concrete inserts.
  - .2 For steel joist: manufactured joist clamp, steel plate washer.
  - .3 For steel beams: manufactured beam clamps:

Part 3 Execution

3.1 GENERAL

.1 Do work in accordance with ASHRAE and SMACNA.

.2 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with ASHRAE, SMACNA.

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of two coats of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

.1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air Systems.

.2 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.3 Do leakage tests in sections.

.4 Make trial leakage tests as instructed to demonstrate workmanship.

.5 Do not install additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.7 Complete test before performance insulation or concealment Work.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
.1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.

.2 Related Requirements
.1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 95.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Co-ordinate submittal requirements and provide submittals required by Section 01 74 21– Construction/Demolition Waste Management and Disposal.

.3 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
.1 Flexible connections.
.2 Duct access doors.
.3 Turning vanes.

.4 Instructions: submit manufacturer's installation instructions.

.5 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.2 Remove from site and dispose of packaging materials at appropriate recycling

facilities.

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

.4 Separate for recycling and place in designated containers Steel, Metal ans Plastic waste in accordance with Waste Management Plan (WMP).

.5 Divert unused metal materials from landfill to recycling facility as approved by Consultant.

Part 2 Products

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks complete with safety chain.

.2 301 to 450 mm: four sash locks complete with safety chain.

.3 451 to 1000 mm: piano hinge and minimum two sash locks.

.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.

.5 Hold open devices.

2.4 TURNING VANES

.1 Factory or shop fabricated double thickness with trailing edge, to recommendations of SMACNA and as indicated.

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 sheet.

3.2 INSTALLATION

.1 Flexible Connections:
- .1 Install in following locations:
  - .1 Inlets and outlets to supply air units and fans.
  - .2 Inlets and outlets of exhaust and return air fans.
  - .3 As indicated.
- .2 Length of connection: 100 mm.
- .3 Minimum distance between metal parts when system in operation: 75 mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 When fan is running:
  - .1 Ducting on sides of flexible connection to be in alignment.
  - .2 Ensure slack material in flexible connection.

.2 Access Doors:
- .1 Locations:
  - .1 Fire and smoke dampers.
  - .2 Control dampers.
  - .3 Devices requiring maintenance.
  - .4 Required by code.
  - .5 Reheat coils.
  - .6 Elsewhere as indicated.

.3 Turning vanes:
- .1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 CLEANING

.1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
  .1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

.2 Related Requirements
  .1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)
  .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-1985.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  .2 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements:
  .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
  .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:
  .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER DAMPERS

.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Double thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm.

.4 Linkage: shaft extension with locking quadrant.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

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 where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration free.

.6 Ensure damper operators are observable and accessible.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Fans, motors, accessories and hardware for commercial use.
- .2 Sustainable requirements for construction and verification.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.
- .2 Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

1.2 REFERENCES

.1 Air Conditioning and Mechanical Contractors (AMCA)
- .1 AMCA Publication 99-2003, Standards Handbook.
- .2 AMCA 300-1996, Reverberant Room Method for Sound Testing of Fans.
- .3 AMCA 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
- .1 ANSI/AMCA 210-1999, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 SYSTEM DESCRIPTION

.1 Performance Requirements:
- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
- .2 Capacity: flow rate, total static pressure, bhp W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
- .3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
- .4 Sound ratings: comply with AMCA 301, tested to AMCA 300. Supply unit with AMCA certified sound rating seal.
- .5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210. Supply unit with AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Provide :
- .1 Fan performance curves showing point of operation, BHP kW and efficiency.
- .2 Sound rating data at point of operation.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:
- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 MAINTENANCE

.1 Extra Materials:
- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .1 Spare parts to include:
    - .1 Matched sets of belts.
- .2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
  - .1 Bearings and seals.
  - .2 Addresses of suppliers.
  - .3 List of specialized tools necessary for adjusting, repairing or replacing.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 FANS GENERAL

.1 Motors:
- .1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC

Equipment supplemented as specified herein.

.2 Sizes as indicated.

.2 Accessories and hardware: matched sets of V-belt drives, adjustable motor bases, belt guards, as indicated and as specified in Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

.3 Factory primed before assembly in colour standard to manufacturer.

.4 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

.5 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

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 FAN INSTALLATION

.1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment, flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

.2 Provide sheaves and belts required for final air balance.

.3 Bearings and extension tubes to be easily accessible.

.4 Access doors and access panels to be easily accessible.

3.3 ANCHOR BOLTS AND TEMPLATES

.1 Size anchor bolts to withstand seismic acceleration and velocity forces as specified 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 SYSTEM DESCRIPTION

.1 Performance Requirements:
- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Indicate following:
- .1 Capacity.
- .2 Throw and terminal velocity.
- .3 Noise criteria.
- .4 Pressure drop.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste

materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 MAINTENANCE

.1 Extra Materials:
- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Include:
  - .1 Keys for volume control adjustment.
  - .2 Keys for air flow pattern adjustment.

Part 2 Products

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:
- .1 Full perimeter gaskets.
- .2 Plaster frames where set into plaster or gypsum board and as specified.
- .3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: standard as directed by Consultant.

2.2 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

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 in accordance with manufacturers instructions.

.2 Install with flat head, stainless steel, screws in countersunk holes where fastenings are visible.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials,

excess materials, rubbish, tools and equipment.

END OF SECTION

DIVISION 25 – INTEGRATED AUTOMATION

Part 1 General

1.1 GENERAL

.1 The work will take place in the existing Block B and Block D buildings of the Institut Maurice-Lamontagne. Operation and activity will be maintained during construction.

1.2 SCOPE OF WORK

.1 The control equipment (HVAC and process engineering) indicated on the plans will be dismantled. The openings resulting from the dismantling of pipes or ducts will be closed.

.2 Controls will be modified or added as indicated on the plans.

.3 The P&IDs for HVAC and process engineering will be updated based on the modifications and/or additions made in the context of the project.

.4 All of the control work (HVAC and process engineering) will be performed by a contractor specialized in this field, under the responsibility of the General Contractor. The work will be performed by Siemens (existing centralisation at the site). Other companies will not be accepted.

.5 All complementary work not specifically indicated, but necessary for the completion of the work described in the plans and specifications, will be carried out.

FIN DE LA SECTION

Part 1 General

1.1 GENERAL

.1 The General Contractor will tour the site in order to fully assess the scope of the demolition work.

.2 All of the control and distribution equipment that will no longer be necessary will be removed, including conductors, surface pipes or ducts, etc.

.3 All of the dismantled material (cables, ducts, conductors, equipment, etc.) will be removed from the site by the General Contractor.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes.
- .1 Methods and procedures for start-up, verification and commissioning, for building Energy Monitoring and Control System (EMCS) and includes:
  - .1 Start-up testing and verification of systems.
  - .2 Check out demonstration or proper operation of components.
  - .3 On-site operational tests.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 DESIGN REQUIREMENTS

.1 Confirm with Consultant that Design Criteria and Design Intents are still applicable.

.2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01330 - Submittal Procedures.

.2 Final Report: submit report to Consultant.
- .1 Include measurements, final settings and certified test results.
- .2 Bear signature of commissioning technician and supervisor
- .3 Report format to be approved by Consultant before commissioning is started.
- .4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Consultant in accordance with Section 01 78 00 - Closeout Submittals.
- .5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.4 CLOSEOUT SUBMITTALS

.1 Provide documentation, O&M Manuals, and training of O&M personnel for review of Consultant before interim acceptance in accordance with Section 01 78 00 - Closeout Submittals.

1.5 COMMISSIONING

.1 Do commissioning in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements.

.2 Carry out commissioning under direction of Consultant and in presence of Departmental Representative and PWGSC Commissioning Manager.

.3 Inform, and obtain approval from, Departmental Representative in writing at least 14 days prior to commissioning or each test. Indicate:

.1 Location and part of system to be tested or commissioned.
.2 Testing/commissioning procedures, anticipated results.
.3 Names of testing/commissioning personnel.

.4 Correct deficiencies, re-test in presence of Departmental Representative and Consultant until satisfactory performance is obtained.

.5 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.

.6 Load system with project software.

.7 Perform tests as required.

1.6 COMPLETION OF COMMISSIONING

.1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Departmental Representative, Consultant and PWGSC Commissioning Manager.

1.7 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION

.1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

Part 2 Products

2.1 EQUIPMENT

.1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.

.2 Instrumentation accuracy tolerances : higher order of magnitude than equipment or system being tested.

.3 Locations to be approved, readily accessible and readable.

.4 Application: to conform to normal industry standards.

Part 3 Execution

3.1 PROCEDURES

.1 Test each system independently and then in unison with other related systems.

.2 Commission each system using procedures prescribed by the Commissioning Manager.

.3 Commission integrated systems using procedures prescribed by Commissioning Manager.

.4 Debug system software.

.5 Optimize operation and performance of systems by fine-tuning PID values and modifying CDLs as required.

3.2 FIELD QUALITY CONTROL

.1 Pre-Installation Testing.
- .1 General: consists of field tests of equipment just prior to installation.
- .2 Testing may be on site or at Contractor's premises as approved by Consultant.
- .3 Configure major components to be tested in same architecture as designed system. Include BECC equipment and 2 sets of Building Controller's including MCU's, LCU's, and TCU's.

.2 Completion Testing.
- .1 General: test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.
- .2 Include following activities:
  - .1 Test and calibrate field hardware including stand-alone capability of each controller.
  - .2 Verify each A-to-D convertor.
  - .3 Test and calibrate each AI using calibrated digital instruments.
  - .4 Test each DI to ensure proper settings and switching contacts.
  - .5 Test each DO to ensure proper operation and lag time.
  - .6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.
  - .7 Test operating software.
  - .8 Test application software and provide samples of logs and commands.
  - .9 Verify each CDL including energy optimization programs.
  - .10 Debug software.
  - .11 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and engineering units. Include space on commissioning technician and Consultant. This document will be used in final startup testing.
- .3 Final Startup Testing: Upon satisfactory completion of tests, perform point-by-point test of entire system under direction of Departmental Representative, Consultant and PWGSC Commissioning Manager and provide:
  - .1 2 technical personnel capable of re-calibrating field hardware and modifying software.
  - .2 Detailed daily schedule showing items to be tested and personnel available.
  - .3 Consultant's acceptance signature to be on executive and applications programs.
  - .4 Commissioning to commence during final startup testing.
  - .5 O&M personnel to assist in commissioning procedures as part of training.
  - .6 Commissioning to be supervised by qualified supervisory personnel and Consultant.
  - .7 Operate systems as long as necessary to commission entire project.
  - .8 Monitor progress and keep detailed records of activities and results.
- .4 Final Operational Testing: to demonstrate that EMCS functions in accordance with

contract requirements.

.1 Prior to beginning of 30day test demonstrate that operating parameters (setpoints, alarm limits, operating control software, sequences of operation, trends, graphics and CDL's) have been implemented to ensure proper operation and operator notification in event of off-normal operation.

.1 Repetitive alarm conditions to be resolved to minimize reporting of nuisance conditions.

.2 Test to last at least 30 consecutive 24 hour days.

.3 Tests to include:

.1 Demonstration of correct operation of monitored and controlled points.

.2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.

.4 System will be accepted when:

.1 EMCS equipment operates to meet overall performance requirements. Downtime as defined in this Section must not exceed allowable time calculated for this site.

.2 Requirements of Contract have been met.

.5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.

.6 Correct defects when they occur and before resuming tests.

.5 Commissioning Manager and Consultant to verify reported results.

3.3 ADJUSTING

.1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative, DCC Representative and Consultant, set and lock devices in final position and permanently mark settings.

3.4 DEMONSTRATION

.1 Demonstrate to Commissioning Manager, Departmental Representative and Consultant operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs in accordance with Section 01 79 00 - Demonstration and Training.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes.
  .1 Requirements and procedures for training program, instructors and training materials, for building Energy Monitoring and Control System (EMCS) Work.

.2 Related Requirements
  .1 Division 01 00 10 – General Instructions.

1.2 DEFINITIONS

.1 CDL - Control Description Logic.

.2 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures, supplemented and modified by requirements of this Section.

.2 Submit training proposal complete with hour-by-hour schedule including brief overview of content of each segment to Departmental Representative 20 days prior to anticipated date of beginning of training.
  .1 List name of trainer, and type of visual and audio aids to be used.
  .2 Show co-ordinated interface with other EMCS mechanical and electrical training programs.

.3 Submit reports within one week after completion of training program that training has been satisfactorily completed.

1.4 QUALITY ASSURANCE

.1 Provide bilingual, competent instructors thoroughly familiar with aspects of EMCS installed in facility.

.2 Departmental Representative and Consultant reserves right to approve instructors.

1.5 INSTRUCTIONS

.1 Provide instruction to designated personnel in adjustment, operation, maintenance and pertinent safety requirements of EMCS installed.

.2 Training to be project-specific.

1.6 TIME FOR TRAINING

.1 Number of days of instruction to be as specified in this section (1 day = 8 hours including two 15 minute breaks and excluding lunch time).

1.7 TRAINING MATERIALS

.1 Provide equipment, visual and audio aids, and materials for classroom training.

.2 Supply manual for each trainee, describing in detail data included in each training program.

.1 Review contents of manual in detail to explain aspects of operation and maintenance (O&M).

1.8 TRAINING PROGRAM

.1 Training should be given in one phase after the provisional acceptance of works.

1.9 MONITORING OF TRAINING

.1 Departmental Representative and Consultant to monitor training program and may modify schedule and content.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 General requirements for building Energy Monitoring and Control System (EMCS) that are common to NMS EMCS Sections.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).
- .1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).
- .1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .1 ASHRAE STD 135-R2001, BACNET - Data Communication Protocol for Building Automation and Control Network.

.4 Canadian Standards Association (CSA International).
- .1 CAN/CSA-Z234.1-89(R1995), Canadian Metric Practice Guide.

.5 Consumer Electronics Association (CEA).
- .1 CEA-709.1-B-2002, Control Network Protocol Specification.

.6 Electrical and Electronic Manufacturers Association (EEMAC).
- .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

1.3 ACRONYMS AND ABBREVIATIONS

.1 Acronyms used in EMCS:
- .1 AEL - Average Effectiveness Level.
- .2 AI - Analog Input.
- .3 AIT - Agreement on International Trade.
- .4 AO - Analog Output.
- .5 BACnet - Building Automation and Control Network.
- .6 BC(s) - Building Controller(s).
- .7 BECC - Building Environmental Control Center.
- .8 CAD - Computer Aided Design.
- .9 CDL - Control Description Logic.
- .10 CDS - Control Design Schematic.
- .11 COSV - Change of State or Value.

.12 CPU - Central Processing Unit.
.13 DI - Digital Input.
.14 DO - Digital Output.
.15 DP - Differential Pressure.
.16 ECU - Equipment Control Unit.
.17 EMCS - Energy Monitoring and Control System.
.18 HVAC - Heating, Ventilation, Air Conditioning.
.19 IDE - Interface Device Equipment.
.20 I/O - Input/Output.
.21 ISA - Industry Standard Architecture.
.22 LAN - Local Area Network.
.23 LCU - Local Control Unit.
.24 MCU - Master Control Unit.
.25 NAFTA - North American Free Trade Agreement.
.26 NC - Normally Closed.
.27 NO - Normally Open.
.28 OS - Operating System.
.29 O&M - Operation and Maintenance.
.30 OWS - Operator Work Station.
.31 PC - Personal Computer.
.32 PCI - Peripheral Control Interface.
.33 PCMCIA - Personal Computer Micro-Card Interface Adapter.
.34 PID - Proportional, Integral and Derivative.
.35 RAM - Random Access Memory.
.36 SP - Static Pressure.
.37 ROM - Read Only Memory.
.38 TCU - Terminal Control Unit.
.39 USB - Universal Serial Bus.
.40 UPS - Uninterruptible Power Supply.
.41 VAV - Variable Air Volume.

1.4 SYSTEM DESCRIPTION

.1 Work covered by sections referred to above consists of updating and modifying existing EMCS, including, but not limited to, following:
.1 Building Controllers.
.2 Control devices.
.3 Complete operating and maintenance manuals.
.4 Training of personnel.
.5 Acceptance tests, technical support during commissioning, full documentation.

.2 Design Requirements:
.1 Design and provide conduit and wiring linking elements of system.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

.2 Quality Control:

.1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.
.2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.
.3 Existing devices intended for re-use: submit test report.

1.6 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Consultant with schedule within 2 weeks after award of Contract.

.2 Waste Management and Disposal:
.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
.4 Separate for recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan.
.5 Place materials defined as hazardous or toxic in designated containers.
.6 Handle and dispose of hazardous materials in accordance with Regional and Municipal, regulations.
.7 Label location of salvaged material's storage areas and provide barriers and security devices.
.8 Ensure emptied containers are sealed and stored safely.
.9 Divert unused metal materials from landfill to recycling facility as approved by Consultant.
.10 Fold up banding, flatten and place in designated area for recycling.

1.8 EXISTING- CONTROL COMPONENTS

.1 Utilize existing control wiring and piping as indicated.

.2 Re-use field control devices that are usable in their original configuration provided that they conform to applicable codes, standards specifications.
.1 Do not modify original design of existing devices without written permission from Departmental Representative.
.2 Provide for new, properly designed device where re-usability of components is uncertain.

.3 Inspect and test existing devices intended for re-use within 30 days of award of contract, and prior to installation of new devices.
.1 Furnish test report within 40 days of award of contract listing each component to

be re-used and indicating whether it is in good order or requires repair by Departmental Representative.

.2 Failure to produce test report will constitute acceptance of existing devices by contractor.

.4 Non-functioning items:

.1 Provide with report specification sheets or written functional requirements to support findings.

.2 Departmental Representative will repair or replace existing items judged defective yet deemed necessary for EMCS.

.5 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.

.6 Assume responsibility for controls to be incorporated into EMCS after written receipt of approval from Departmental Representative.

.1 Be responsible for items repaired or replaced by Departmental Representative.

.2 Be responsible for repair costs due to negligence or abuse of equipment.

.3 Responsibility for existing devices terminates when applicable portions of EMCS as approved by Departmental Representative and Consultant.

.7 Remove existing controls not re-used or not required. Place in approved storage for disposition as directed.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation: to manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes.
- .1 Methods and procedures for shop drawings submittals, preliminary and detailed review process including review meetings, for building Energy Monitoring and Control System (EMCS).

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.3 DESIGN REQUIREMENTS

.1 Preliminary Design Review: to contain following contractor and systems information.
- .1 Location of local office.
- .2 Description and location of installing and servicing technical staff.
- .3 Location and qualifications of programming design and programming support staff.
- .4 List of spare parts.
- .5 Location of spare parts stock.
- .6 Names of sub-contractors and site-specific key personnel.
- .7 Sketch of site-specific system architecture.
- .8 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
- .9 Item-by-item statement of compliance.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and coordinate with requirements in this Section.

.2 Shop Drawings to consist of 1 scanned copy of shop drawings and product data.

.3 Copy be completely indexed and coordinated package to assure compliance with contract.

.4 Copy to be in Acrobat Software.

1.7 QUALITY ASSURANCE

.1 Departmental Representative and Consultant retains right to revise sequence or subsequent CDL prior to software finalization without cost.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes.
- .1 Requirements and procedures for final control diagrams and operation and maintenance (O&M) manual, for building Energy Monitoring and Control System (EMCS) Work.

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 DEFINITIONS

.1 BECC - Building Environmental Control Centre.

.2 OWS - Operator Work Station.

.3 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 78 00 - Closeout Procedures, supplemented and modified by requirements of this Section.

.2 Submit Record Documents As-built drawings, Operation and Maintenance Manual to Consultant in English and French.

.3 Provide soft copies and hard copies in hard-back, 50 mm 3 ring, D-ring binders.
- .1 Binders to be 2/3 maximum full.
- .2 Provide index to full volume in each binder.
- .3 Identify contents of each manual on cover and spine.
- .4 Provide Table of Contents in each manual.
- .5 Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

1.4 AS-BUILTS

.1 Provide 1 copy of detailed shop drawings generated in Section 25 05 02 - EMCS: Submittals and Review Process and include:
- .1 Changes to contract documents as well as addenda and contract extras.
- .2 Changes to interface wiring.
- .3 Routing of conduit, wiring and control air lines associated with EMCS installation.
- .4 Locations of obscure devices to be indicated on drawings.
- .5 Listing of alarm messages.
- .6 Panel/circuit breaker number for sources of normal/emergency power.
- .7 Names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
- .8 Test procedures and reports: provide records of start-up procedures, test procedures, checkout tests and final commissioning reports as specified in Section

25 01 11 - EMCS: Start-up, Verification and Commissioning.

.9 Basic system design and full documentation on system configuration.

.2 Submit for final review by Consultant.

.3 Provide before acceptance 2 Hard and 1 soft copy incorporating changes made during final review.

1.5 O&M MANUALS

.1 Custom design O&M Manuals (both hard and soft copy) to contain material pertinent to this project only, and to provide full and complete coverage of subjects referred to in this Section.

.2 Provide 2 complete sets of hard and soft copies prior to system or equipment tests

.3 Include complete coverage in concise language, readily understood by operating personnel using common terminology of functional and operational requirements of system. Do not presume knowledge of computers, electronics or in-depth control theory.

.4 Functional description to include:

.1 Functional description of theory of operation.

.2 Design philosophy.

.3 Specific functions of design philosophy and system.

.4 Full details of data communications, including data types and formats, data processing and disposition data link components, interfaces and operator tests or self-test of data link integrity.

.5 Explicit description of hardware and software functions, interfaces and requirements for components in functions and operating modes.

.6 Description of person-machine interactions required to supplement system description, known or established constraints on system operation, operating procedures currently implemented or planned for implementation in automatic mode.

.5 System operation to include:

.1 Complete step-by-step procedures for operation of system including required actions at each OWS.

.2 Operation of computer peripherals, input and output formats.

.3 Emergency, alarm and failure recovery.

.4 Step-by-step instructions for start-up, back-up equipment operation, execution of systems functions and operating modes, including key strokes for each command so that operator need only refer to these pages for keystroke entries required to call up display or to input command.

.6 Maintenance: document maintenance procedures including inspection, periodic preventive maintenance, fault diagnosis, repair or replacement of defective components, including calibration, maintenance, repair of sensors, transmitters, transducers, controller and interface firmware's, plus diagnostics and repair/replacement of system hardware.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes.
  .1 Requirements and procedures for identification of devices, sensors, wiring tubing, conduit and equipment, for building Energy Monitoring and Control System (EMCS) Work and nameplates materials, colours and lettering sizes.

.2 Related Requirements
  .1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 CSA C22.1-02, The Canadian Electrical Code, Part I 23th Edition, Safety Standard for Electrical Installations.

1.3 DEFINITIONS

.1 For acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.4 SYSTEM DESCRIPTION

.1 Language Operating Requirements: provide identification for control items in English and French.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures supplemented and modified by requirements of this Section.

Part 2 Products

2.1 NAMEPLATES FOR PANELS

.1 Identify by Plastic laminate, 3 mm thick Melamine, matt white finish, black core, square corners, lettering accurately aligned and engraved into core.

.2 Sizes: 25 x 67 mm minimum.

.3 Lettering: minimum 7 mm high, black.

.4 Inscriptions: machine engraved to identify function.

2.2 NAMEPLATES FOR FIELD DEVICES

.1 Identify by plastic encased cards attached by chain plastic tie.

.2 Sizes: 50 x 100 mm minimum.

.3 Lettering: minimum 5 mm high produced from laser printer in black.

.4 Data to include: point name and point address.

.5 Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.

2.3 NAMEPLATES FOR ROOM SENSORS

.1 Identify by stick-on labels using point identifier.

.2 Location: as directed by Consultant.

.3 Letter size: to suit, clearly legible.

2.4 WIRING

.1 Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets and outlet boxes.

.2 Colour coding: to CSA C22.1-15. Use colour coded wiring in communications cables, matched throughout system.

.3 Power wiring: identify circuit breaker panel/circuit breaker number inside each EMCS panel.

2.5 CONDUIT

.1 Colour code EMCS conduit.

.2 Pre-paint box covers and conduit fittings.

.3 Coding: use fluorescent orange paint and confirm colour with Consultant during "Preliminary Design Review".

Part 3 Execution

3.1 NAMEPLATES AND LABELS

.1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.

3.2 EXISTING PANELS

.1 Correct existing nameplates and legends to reflect changes made during Work.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressures Fittings.
- .2 ANSI C2-1990, National Electrical Safety Code.
- .3 ANSI/NFPA 70-1990, National Electrical Code.

.2 CSA Group
- .1 CSA C22.1-12. The Canadian Electrical Code,
- .2 CSA C22.2 No. 45.1-07(R2012), Electrical Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.

1.3 SYSTEM DESCRIPTION

.1 Electrical:
- .1 Provide power wiring from existing power panels to EMCS field panels. Circuits to be for exclusive use of EMCS equipment. Panel breakers to be identified on panel legends tagged and locks applied to breaker switches.
- .2 Hard wiring between field control devices and EMCS field panels.
- .3 Communication wiring between EMCS field panels and OWS's including main control centre BECC.

1.4 PERSONNEL QUALIFICATIONS

.1 Qualified supervisory personnel to:
- .1 Continuously direct and monitor all work.
- .2 Attend site meetings.

1. 5 EXISTING CONDITIONS

.1 Cutting and Patching: refer to Section 01 73 00 - Execution supplemented as specified herein.

.2 Repair all surfaces damaged during execution of work.

.3 Turn over to Departmental Representative existing materials removed from work not identified for re-use.

Part 2 Products

2.1 WIRING

.1 As per requirements of Division 26.

.2 For 70V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600V. Colour code to CSA 22.1.

.3 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. All other cases use FT4 wiring.

.4 Sizes:
- .1 120V Power supply: to match or exceed breaker, size #12 minimum.
- .2 Field wiring to digital device: #18 AWG.
- .3 Analog input and output: shielded #18 minimum solid copper. Wiring must be continuous without joints.

2.2 CONDUIT

.1 As per requirements of Division 26.

.2 PVC Electrical tubing.

.3 PVC Junction and pull boxe :
- .1 Surface mounting cast FS: screw-on flat covers.
- .2 Flush mounting: covers with 25 mm minimum extension all round.

.4 Outlet boxes: 100 mm minimum, square.

3 Execution

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

3.2 ELECTRICAL GENERAL

.1 Do complete installation in accordance with requirements of:
- .1 Division 26, this specification.
- .2 CSA 22.1 Canadian Electrical Code.
- .3 ANSI/NFPA 70.
- .4 ANSI C2.

.2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage above 70 V contacts and mark to prevent accidental injury.

.3 Conform to manufacturer's recommendations for storage, handling and installation.

.4 Protect exposed live equipment such as panel, mains, outlet wiring during construction for

personnel safety.

.5 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.

.6 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes.

.7 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

3.3 CONDUIT SYSTEM

.1 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fill not to exceed 40%. Design drawings do not show conduit layout.

.2 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.

.3 Limit conduit length between pull boxes to less than 30 m.

.4 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.

.5 Fastenings and supports for conduits, cables, and equipment:
- .1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated and as required to support cable and conduit runs.

.6 Install polypropylene fish cord in empty conduits for future use.

.7 Conduits may be run in flanged portion of structural steel.

.8 Group conduits wherever possible on suspended or surface channels.

.9 Pull boxes:
- .1 Install in inconspicuous but accessible locations.
- .2 Support boxes independently of connecting conduits.
- .3 Fill boxes with paper or foam to prevent entry of construction material.
- .4 Provide correct size of openings. Reducing washers not permitted.
- .5 Mark location of pull boxes on record drawings.
- .6 Identify AC power junction boxes, by panel and circuit breaker.

.10 Install bonding conductor for 120 volt and above in conduit.

3.4 WIRING

.1 Install multiple wiring in ducts simultaneously.

.2 Do not pull spliced wiring inside conduits or ducts.

.3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.

.4 Remove insulation carefully from ends of conductors and install to manufacturer's

recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.

.5 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.

.6 Do not allow wiring to come into direct physical contact with compression screw.

.7 Install ALL strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

3.5 IDENTIFICATION

.1 Refer to Section 25 05 54 - EMCS: Identification.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes.
- .1 Requirements and procedures for warranty and activities during warranty period and service contracts, for building Energy Monitoring and Control System (EMCS).

.2 Related Requirements
- .1 Division 01 00 10 – General Instructions.

1.2 DEFINITIONS

.1 BC(s) - Building Controller(s).

.2 OWS - Operator Work Station.

.3 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit detailed preventative maintenance schedule for system components to Consultant.

.3 Submit detailed inspection reports to Consultant.

.4 Submit dated, maintenance task lists to Consultant and include the following sensor and output point detail, as proof of system verification:
- .1 Point name and location.
- .2 Device type and range.
- .3 Measured value.
- .4 System displayed value.
- .5 Calibration detail
- .6 Indication if adjustment required,
- .7 Other action taken or recommended.

.5 Records and logs: in accordance with Section 01 78 00 - Closeout Submittals.
- .1 Maintain records and logs of each maintenance task on site.
- .2 Organize cumulative records for each major component and for entire EMCS chronologically.
- .3 Submit records to Consultant, after inspection indicating that planned and systematic maintenance have been accomplished.

.6 Revise and submit to Consultant in accordance with Section 01 78 00 - Closeout Submittals "As-built drawings" documentation and commissioning reports to reflect changes, adjustments and modifications to EMCS made during warranty period.

1.4 MAINTENANCE SERVICE DURING WARRANTY PERIOD

.1 Provide services, materials, and equipment to maintain EMCS for specified warranty period. Provide detailed preventative maintenance schedule for system components as described in Submittal article.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Control devices integral to the Building Energy Monitoring and Control System (EMCS): transmitters, sensors, controls, meters, switches, transducers, dampers, damper operators, valves, valve actuators and low voltage current transformers.
- .2 Related Sections:
  - .1 Section 01 73 00 - Execution Requirements.
  - .2 Section 25 01 11 - EMCS: Start-Up, Verification and Commissioning.
  - .3 Section 25 05 01 - EMCS: General Requirements.
  - .4 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.
  - .5 Section 25 05 54 - EMCS: Identification.
  - .6 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI).
- .1 ANSI C12.7-1993(R1999), Requirements for Watthour Meter Sockets.
- .2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM B 148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.

.3 National Electrical Manufacturer's Association (NEMA).
- .1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).

.4 Air Movement and Control Association, Inc. (AMCA).
- .1 AMCA Standard 500-D-98, Laboratory Method of Testing Dampers For Rating.

.5 Canadian Standards Association (CSA International).
- .1 CSA-C22.1-02, Canadian Electrical Code, Part 1 (23th Edition), Safety Standard for Electrical Installations.

1.3 DEFINITIONS

.1 Acronyms and Definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittals and Review Process.

.2 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions for specified equipment and devices.

1.5 EXISTING CONDITIONS

.1 Turn over to Departmental Representative existing materials removed from Work not identified for re-use.

Part 2 Products

2.1 GENERAL

.1 Control devices of each category to be of same type and manufacturer.

.2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, assembly.

.3 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.4 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.

2.2 HUMIDITY TRANSMITTERS

.1 Requirements:
- .1 Input signal: from RH sensor.
- .2 Output signal: 4 - 20 mA onto 500 ohm maximum load.
- .3 Input and output short circuit and open circuit protection.
- .4 Output variations: not to exceed 0.2 % of full scale output for supply voltage variations of plus or minus 10 %.
- .5 Output linearity error: plus or minus 1.0% maximum of full scale output.
- .6 Integral zero and span adjustment.
- .7 Temperature effect: plus or minus 1.0 % full scale/ 6 months.
- .8 Long term output drift: not to exceed 0.25 % of full scale output/ 6 months.

2.3 CURRENT TRANSDUCERS

.1 Requirements:

.2 Purpose: combined sensor/transducer, to measure line current and produce proportional signal in one of following ranges:
- .1 4-20 mA DC.
- .2 0-1 volt DC.
- .3 0-10 volts DC.
- .4 0-20 volts DC.

.3 Frequency insensitive from 10 - 80 hz.

.4 Accuracy to 0.5% full scale.

.5 Zero and span adjustments. Field adjustable range to suit motor applications.

.6 Adjustable mounting bracket to allow for secure/safe mounting inside MCC.

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

3.2 IDENTIFICATION

.1 Identify field devices in accordance with Section 25 05 54 - EMCS: Identification.

3.3 TESTING AND COMMISSIONING

.1 Calibrate and test field devices for accuracy and performance in accordance with Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

END OF SECTION

DIVISION 26 – ELECTRICAL

Part 1 General

1.1 GENERAL

.1 The work will take place in the existing Block B and Block D buildings of the Institut Maurice-Lamontagne. Operation and activity will be maintained during construction.

1.2 SCOPE OF WORK

.1 The equipment indicated on the plans will be dismantled. The openings resulting from the dismantling of the pipes or ducts will be closed.

.2 The variable frequency drives and switches will be provided and installed as indicated on the plans and in the connection table.

.3 The equipment, material and accessories related to the 120/208V and 347/600V power distribution networks will be provided, installed and connected as indicated.

.4 Unless otherwise indicated, power supply cables (120 à 600V) will be provided, installed and connected by the electricity division.

.5 Unless otherwise indicated, control cables (#14 and #16) conduits will be supplied and installed by the electricity division.

.6 The existing power distribution panels will be modified based on the construction and demolition work.

.7 All complementary work not specifically indicated, but necessary for the completion of the work described in the plans and specifications, will be carried out.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The General Contractor will tour the site in order to fully assess the scope of the demolition work.

.2 All of the power distribution equipment that will no longer be necessary will be removed, including conductors, surface pipes or ducts, etc.

.3 All of the dismantled material (cables, pipes or ducts, conductors, etc.) will be removed from the site by the General Contractor.

.4 All of the circuits that will be cut due to demolition activities or the drilling of existing surfaces will be re-wired.

.5 The General Contractor will remove all of the wires and tubes up to the last preserved output, if applicable, or up to the power distribution switchboard.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-F15, Canadian Electrical Code, Part 1 (23th Edition), Safety Standard for Electrical Installations.
- .2 CSA C22.2 No. 0-F10.
- .3 CAN3-C235-F83(C2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
- .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
- .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

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

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

.4 Use one nameplate both languages.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for review single line electrical diagrams under plexiglass in glazed frames and locate as indicated.
- .1 Electrical distribution system in main electrical room.

.3 Shop drawings:
- .1 Indicate of drawings clearances for operation, maintenance, and replacement of

operating equipment devices.

.4 Quality Control: in accordance with Section 01 45 00 - Quality Control.
- .1 Provide CSA certified equipment and material.
- .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction inspection authorities for special approval before delivery to site.
- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified and licensed electricians.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Consultant with schedule within 2 weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.8 SYSTEM STARTUP

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

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

1.9 OPERATING INSTRUCTIONS

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:
- .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- .3 Safety precautions.
- .4 Procedures to be followed in event of equipment failure.
- .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

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

.2 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.3 WARNING SIGNS

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

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters

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

.2 Wording on nameplates to be approved by Consultant prior to manufacture.

.3 Allow for minimum of twenty-five (25) letters per nameplate.

.4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.6 Terminal cabinets and pull boxes: indicate system and voltage.

.7 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

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

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

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

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security	Red	Yellow

Systems

Part 3 Execution

3.1 INSTALLATION

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

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.
.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

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

.4 Locate light switches on latch side of doors.
.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 FIELD QUALITY CONTROL

.1 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
- .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.
- .3 Lighting and its control.
- .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

3.8 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-C22.2 No.18.2-06 (R2011), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- .2 CSA C22.2 No.65-13, Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

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

.4 Divert unused wiring materials from landfill to metal recycling facility as approved by Consultant.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

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

.3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:
- .1 Connector body and stud clamp for round copper conductors tube.
- .2 Clamp for round copper conductors.
- .3 Stud clamp bolts.
- .4 Bolts for copper conductors.
- .5 Sized for conductors.

.4 Clamps or connectors for armoured cable, mineral insulated cable, and non-metallic

sheathed cable as required to: CAN/CSA-C22.2 No.18.2-06(R2011).

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:
- .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
- .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65-13.
- .3 Install fixture type connectors and tighten. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y-2 and NEMA.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 PRODUCT DATA

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE or RWU90 XLPE as indicated.

2.2 TECK 90 CABLE

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

.2 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.

.3 Insulation:
- .1 Ethylene propylene rubber EP.
- .2 Cross-linked polyethylene XLPE.
- .3 Rating : 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: flat aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride, [compliant to applicable Building Code classification for this project].

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

.8 Connectors:
.1 Watertight approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Type: ACWU90 PVC jacket over thermoplastic armour and compliant to applicable Building Code classification for this project wet locations.

.5 Connectors: anti short connectors.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

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

.2 Perform tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

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

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

.3 Conductor length for parallel feeders to be identical.

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

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

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section [26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings].

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed and concealed, securely supported by hangers.

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.2 No. 0-10, R2015.
- .2 CSA C22.2 No.41-13, Grounding and Bonding Equipment.

1.3 PRODUCT DATA

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

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

.4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Consultant.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

.1 Copper long barrel or short barrel compression connectors to CSA C22.2 No. 41-13 as required sized for conductors.

.2 Contact aid for aluminum cables where applicable.

.3 2, 3 or 4 way joint boxes submarine type in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

Part 3 Execution

3.1 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2 No.41.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  .1 ANSI/IEEE 837-2014, Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

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

Part 2 Products

2.1 MATERIALS

.1 Conductors: bare, stranded, tinned soft annealed copper wire, size No. 4/0 AWG and 2/0 AWG for ground bus, electrode interconnections, metal structures, gradient control mats, transformers, switchgear, motors, ground connections.

.2 Conductors: pvc insulated coloured green, stranded tinned soft annealed copper wire, size No. 4 AWG for grounding cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers.

.3 Conductors: pvc insulated coloured green, stranded tinned soft annealed copper wire No. 10 AWG for grounding meter and relay cases.

.4 Accessories: non-corroding, necessary for complete grounding system, type, size material as indicated, including:
  .1 Grounding and bonding bushings.
  .2 Protective type clamps.
  .3 Bolted type conductor connectors.
  .4 Thermit welded type conductor connectors.
  .5 Bonding jumpers, straps.

.6 Pressure wire connectors.

.5 Cable sheath isolating sleeves.

Part 3 Execution

3.1 INSTALLATION

.1 Install continuous grounding system including, electrodes, conductors, connectors and accessories as indicated and to requirements of local authority having jurisdiction.

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

.3 Protect exposed grounding conductors during and after construction.

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

.5 Use No. 4/0 AWG bare copper cable for main ground bus of substation and No. 2/0 AWG mhd bare copper cable for taps on risers from main ground bus to equipment.

.6 Do not use bare copper conductors near un-jacketed lead sheath cables.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections as indicated to typical station equipment including: metallic water main, line sky wire, neutral, gradient control mats. Non current carrying parts of: transformers, generators, motors, circuit breakers, reclosers, current transformers, frames of gang-operated switches and fuse cutout bases. Cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers. Meter and relay cases. Any exposed building metal, within or forming part of station enclosure. Sub-station fences, pothead bodies. Outdoor lighting.

3.3 FIELD QUALITY CONTROL

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

.2 Perform earth loop test and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction.

.3 Perform test before energizing electrical system.

.4 Provide step-and-touch potential calculations using measured station ground resistance measurements. Submit test result and inspection certificate before energizing electrical system.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
  .1 ANSI/IEEE 837-2014, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

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

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Grounding conductors: stranded copper, tinned, soft annealed, insulated (Green) size as indicated.

.3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  .1 Grounding and bonding bushings.
  .2 Protective type clamps.
  .3 Bolted type conductor connectors.
  .4 Thermit welded type conductor connectors.
  .5 Bonding jumpers, straps.
  .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where PVC is used, run ground wire in conduit.

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

.3 Protect exposed grounding conductors from mechanical injury.

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

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

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

3.2 EQUIPMENT GROUNDING

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

3.3 FIELD QUALITY CONTROL

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

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

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

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended as required.

Part 3 Execution

3.1 INSTALLATION

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

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

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

.6 Fasten exposed conduit or cables to building construction or support system using straps.
- .1 One-hole malleable iron or steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

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

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

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

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23th Edition.

1.3 INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

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

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

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

2 Products

2.1 JUNCTION AND PULL BOXES

.1 Construction : PVC enclosure.

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

.3 Covers Surface Mounted: screw-on flat or turned edge covers.

3 Execution

3.1 JUNCTION PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

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

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23th Edition.

1.3 INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

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

2.2 PVC OUTLET BOXES

.1 One-piece PVC construction.

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

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

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

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

2.3 CONDUIT BOXES

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

2.4 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

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

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

2.5 SERVICE FITTINGS

.1 'High tension' receptacle fitting made of 2 piece stainless steel. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.

.2 Pedestal type 'low tension' fitting made of 2 piece stainless steel.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

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

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

.6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18-R2011, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3-15, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.3 INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
- .1 Submit cable manufacturing data.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CONDUITS

.1 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.2 CONDUIT FASTENINGS

.1 One hole malleable iron straps to secure surface conduits NPS 2 50 mm and smaller.

.2 Two hole malleable iron straps for conduits larger than NPS 2 50 mm.

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

.4 Channel type supports for two or more conduits.

.5 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

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

.2 Ensure factory "ells" where 90 degrees bends for NPS 1 25 mm and larger conduits.

.3 Watertight connectors and couplings for PVC.

.4 Set-screws are not acceptable.

2.4 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

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

.3 Use rigid PVC conduit.

.4 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without prewired outlet box, connection to surface or recessed fluorescent fixtures and work in movable metal partitions.

.5 Use liquid tight flexible PVC conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.6 Install conduit sealing fittings.

.7 Minimum conduit size for lighting and power circuits: NPS 3/4 19 mm.

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

.9 Install fish cord in empty conduits.

.10 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.11 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on suspended surface channels.

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

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

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

.4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Consultant.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

.1 Fused disconnect switch: in accordance with Section 26 28 23 - Disconnect Switches - Fused and Non-Fused, rating as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install service equipment.

.2 Connect to incoming service.

.3 Connect to outgoing load circuits.

.4 Install ground fault equipment.

.5 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Division 10 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA C22.2 No.4-16, Enclosed Switches.
- .2 CSA C22.2 No.39-13, Fuseholder Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

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

.4 Separate for recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Fusible, or non-fusible, disconnect switch in CSA Enclosure NEMA 4x, to CAN/CSA C22.2 No.4 S:22 size as indicated.

.2 Provision for padlocking in on-off switch position by locks.

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

.4 Fuses: size as indicated.

.5 Fuse holders: [to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse

indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section includes the specific technical clauses for the execution of the cathodic protection system elements.

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions

.2 Section 01 61 00 – Common Products Requirements

.3 Section 05 50 00 – Steel

1.3 REFERENCES

.1 Contractor must comply with the codes, standards and regulations, as well as with the good practice rules as recommended by the following associations, related to the Work to be executed. The federal laws and regulations prevail on the other codes and standards.

.1 ANSI, American National Standards Institute

.2 API, American Petroleum Institute

.3 ASME, American Society of Mechanical Engineers

.4 ASM, American Society for Metals

.5 ASTM, American Society for Testing and Materials

.6 AWS, American Welding Society

.7 AWWA, American Water Works Association

.8 BNQ, Bureau de Normalisation du Québec

.9 CEMA, Canadian Electrical Manufacturers Association

.10 CEQ, Quebec Electrical Code

.11 CGSB, Canadian Government Standard Board

.12 CPQ, Quebec Plumbing Code

.13 CSA, Canadian Standards Association

.14 CSST, Code de sécurité pour les travaux en construction

.15 MDDEP, Ministère du développement durable, de l'environnement et des parcs du Québec

.16 NACE, National Association of Corrosion Engineers

.17 NBC, National Building Code

.18 NFPA, National Fire Protection Association

.19 SSPC, Steel Structures Painting Council

.20 ULC, Underwriters Laboratory of Canada

.2 The edition prevailing for the above-mentioned standards, laws and regulations is the one in force at the time of the Call for Tenders. However, the Contractor must not restrict himself to the application of the above-mentioned standards only, but he must rather comply with all the standards to which his work could be related to.

1.4 CONTRACTOR'S COMPETENCE

.1 Contractor should have personnel being qualified for the cathodic protection system installation and in electricity. He should submit a report written by a competent professional authorized to work in the province of Quebec, certifying that the equipment and its installation comply with the regulations in force. There must be in his team engineers specialized in electricity to seal plans and to take in charge work done in their own field.

1.5 GUARANTEE

.1 Regardless the Contract general clauses, during the guarantee period, if the cathodic protection system stops due to the total or partial failure of the system, the duration of this failure will be added to the guarantee period, so that finally, the owner gets a total of two (2) years of good operating condition for his system.

.2 After notification to Contractor, the department's representatives will repair the cathodic protection system during the guarantee period, without affecting the guarantee conditions.

1.6 VERIFICATION OF BASIC DATA FOR THE PROJECT REALIZATION

.1 Contractor must verify himself the basic data required for the project whole realization. He must ensure he has on hand all the information required for the installation and good operation of the system. The Departmental Representative will supply him all the data available. If they are required, all additional tests, site visits or other actions necessary to the project realization will be at the Contractor's charge.

1.7 SHOP DRAWINGS

.1 Five (5) days after the reception of acceptance of Offer notice, the Contractor must give to the Departmental Representative the list of shop works he intends to make before beginning the work in situ.

.2 The Departmental Representative will proceed to various inspections of these shop works. The Contractor should give all the facilities to the Departmental Representative so they have access and can properly examine the components and assemblies at various stages upon the Departmental Representative request.

.3 The inspections do not reduce in any way the Contractor's responsibility regarding the quality of his materials and workmanship.

1.8 WORK DESCRIPTION

Without being restricted, the works are as follows:

.1 In each well, the contractor must install the equipment of cathodic protection systems which consists of three anodes and two reference electrodes. The work will be carried out in dry conditions and for this, the contractor must install the necessary scaffolding. Also, the Contractor shall prepare its security plan of work in the well and he is the only one responsible for safety on the site.

.2 In the service building, the contractor must install the rectifiers, the RMU and the electrical equipment and cables for AC and DC. The location of the rectifiers and RMUs will be determined on site.

.3 All metal parts that will be installed will be of AISI 316L stainless steel. The contractor must have the necessary welding procedures and the welders shall be qualified for the work to be performed in all positions. The installation of the metal parts in the wells requires that measurements must be done on site. On the plans, the equipment positions are approximate and the contractor must check the dimensions on site before starting the work.

.4 Before starting the work, at the satisfaction of the Ministerial Representative, the contractor must do the inspection of all existing metal parts and must check the electrical continuity of all bolted connections. At each connection, the contractor should execute a plug weld to confirm the electrical continuity.

.5 Two workshop visits are scheduled for inspection of materials prior to delivery to site.

.6 At the end of the work, the contractor must undertake the setting of the rectifiers and the calibration of RMU. It must ensure the fees for the first year of operation of the RMU.

1.9 MINIMUM REQUIREMENTS

.1 The specifications and plans give the minimum requirements for the Work execution. The Work should be executed in accordance with the other regulations and codes in force in the province of Quebec.

Contractor must make sure his personnel is qualified for the work execution, particularly concerning the Quebec Electrical Code and cathodic protection specialty.

.2 The electrical plans are schematic and the Contractor must make sure that the asked installation complies with the codes in force. Then, the works must be executed by competent personnel.

.3 Before proceeding with the electrical connection, a document signed by an authorized engineer must be provided to the Departmental Representative, certifying that the installation complies with the codes and standards in force in the province of Quebec.

1.10 OPERATION AND MAINTENANCE DATA

.1 At the most 15 days after the completion of work, provide six (6) copies of a maintenance manual written in French.

.2 Include the following information in the document

.1 The description and the operating and maintenance instructions of the various equipment, including the complete list of the equipment and of its components.

.2 The names, addresses and phone numbers of the sub-traders and professionals.

.3 The guarantees and their duration.

.4 The manufacturer identification and the origin of the products used in the present project.

.5 The action to take in the case of an emergency.

.6 The electrical components verification in order to prevent any accidents and particularly electrical shocks.

Part 2 Products

2.1 GENERAL

.1 All the materials used for the installation of the wharf cathodic protection system should be designed for a 20-year minimum duration in marine environment.

2.2 PLATINIZED NIOBIUM ANODES

.1 The anodes characteristics for the impressed current cathodic protection system are indicated on plans.

.2 The anodes will be Anomet 40 type with a platinum film of 5 microns (200 micro-inches) thick. The effective length of the anodes is 2.5m. Anode's rods must be installing in the assembly as show on plans.

The junction anodes – electrical conductors is made with a mechanical connection and with a silver weld. The connection is protected with a thermo retractable sleeve and with epoxy. The Contractor must submit the connection's protection mode for approval.

2.3 REFERENCE ELECTRODES

.1 Reference electrodes are Borin Stelth type, model SRE-004-SFB, specifically designed for sea-water utilization (silver - silver chloride electrodes).

.2 Reference electrodes are protected by a PVC conduit, as indicated on plans.

2.4 CORROSION SAMPLES

.1 The corrosion samples will be made out of AISI 316L stainless steel. The samples supports must be in electrical contact with the corrosion samples via connection bolts. The electrical continuity must be checked.

.2 The corrosion samples surfaces must be polished and the oxide removed.

.3 The corrosion samples will be installed only upon the rectifier start-up.

2.5 RECTIFIERS

.1 The two rectifiers must be specifically designed for cathodic protection in marine environment. The weld of rectifier casings must be done under protected gas to avoid the sezitivation of and the marine corrosion. The location will be determinate on site.

.2 The general characteristics of the rectifier are as follows:

.1 Air cooling rectifier

.2 Constant voltage type with 25 adjustment steps

.3 The casing of the rectifier is made out of painted steel.

.4 Rectifier made stainless steel supports anchored to the slab made out of stainless steel

.5 Ventilated, thermal protected with automatic starter

.6 Lightning protection

.7 Voltage and amperage measurements terminals

.8 Local ON/OFF terminal

.9 Circuit for a remote ON/OFF

.10 High limit amperage protection system

.11 Ampere meter and volt meter.

.12 Timer for ON/OFF function

.3 At the secondary, the rectifiers should supply 90 A at 18 VDC. Rectifier must be protected at maximum DC current.

2.6 ELECTRICAL CABLES AND CONNECTIONS

.1 All the AC cables must be copper and the fabrication and dimensions must comply with in force Electrical Code.

.2 All the immersed DC cables must be specifically designed to permanently resist to sea-water. Contractor must supply a certification of such. The anodes immersed cables must be double insulated, Hallar type and H.M.W.P.E., and protected by a flexible conduit in the sections that are not protected by a metallic channel.

.3 The other DC cables must be designed for sea-water utilization.

.4 The cables splices must be designed for sea-water utilization. Contractor must provide, for approval, a sample and the technical data sheets of the materials taken for the splices execution. As a guide for the splices fabrication, the Contractor must take the following requirements into account:

.1 The cables connection will be double: mechanical and by a weld.

.2 It is the Contractor's responsibility to design and make the splices according to the preceding requirements or otherwise. the Contractor can propose other types of splices or improve the ones described above. In all cases, the Contractor must provide a shop drawing and a sample of his design at least one week before the splices fabrication.

.3 It is specifically indicated that the epoxy layer must be shop made in controlled temperature and moisture conditions, according to the product technical data sheet.

.5 The minimum dimension (No. AWG) of the cables is as follows:

.1 All anodes cables are Hallar and HMWPE, no 8 type.

.2 The anodes main cables and the structure negative cables are Nr. 1, RWU 90 type.

2.7 OTHER ELECTRICAL COMPONENTS

.1 The Contractor must install the electrical components on the AC power circuit, according to indications on the plans.

.2 All the equipment must comply with the requirements of the Electrical Code in force. It is the Contractor's responsibility to make sure the equipment and installation are in accordance with the electrical codes in force.

2.8 OTHER EQUIPEMENT

.1 The other equipment will be made in accordance with the standards currently in force and protected against public access.

2.9 MATÉRIALS USED

.1 It is not allowed to use materials other than those CSA approved. The electrical equipment selection must be approved by an electrical engineer retained by the Contractor.

.2 All the materials should be selected so they can resist to the marine environment conditions.

2.10 RMU

.1 The long-term performance assessment will be made with a data acquisition system and by a communication system to be installed in Services Building. This equipment is called in the project as ''RMU'' (''Remote Monitoring Unit'').

.2 The system should perform the following operations:

.1 Data saving to pre-determined cycles. The data to be collected are the potential indicated by all the reference electrodes, the voltage, the power supplied by the rectifier.

.2 Allow simultaneous saving in real time of the data collected by the data acquisition system.

.3 Save the software parameters in non-volatile memory.

.4 Save at regular intervals the above-mentioned data.

.5 Read or save the data in ON/OFF mode according to data acquisition system predetermined cycles.

.6 Allow the remote ON/OFF interruption of each one of the rectifiers.

.3 The data acquisition software characteristics are as follows:

.1 Allow reading in real time of the data collected by the data acquisition system.

.2 Allow ON/OFF interruption and examine the data collected previously.

.3 Allow to predetermine the system control data collection cycles and the components ON/OFF interruption.

.4 Allow to save on disk and print the data collected.

.4 The RMU are Mobilex type each with 4 channels with satellite data transmission. The contractor must install two (2) RMU.

Part 3 Execution

3.1 ANODES PREPARATION

.1 The anodes will be shop made. Anodes should be carefully inspected by Contractor before commencing assembly. No platinum film damage will be tolerated.

.2 Contractor must assemble anodes as indicated on plans. The anodes active length must be strictly respected.

.3 The anodes fixation to the electrical conductor will first be made with a mechanical connector followed by a weld silver joint.

.4 At the other end, Contractor must protect the copper core and the niobium casing with a weld so that they cannot get into contact with sea-water. This weld will be made by the anodes manufacturer, Anomet.

.5 The dead part of the anodes and the cable fixation to the anode will be sealed with epoxy. The Contractor should take all the necessary precautions to avoid that these can get into contact with sea-water.

.6 The anode cable must be protected by a PVC flexible conduit. The end of this conduit must also be sealed with epoxy.

.7 The PVC conduit threaded connections, caps and sleeves composing the anode assembly must also be sealed with epoxy.

3.2 REFERENCE ELECTRODES PREPARATION

.1 The reference electrodes will be installed in PVC conduits in the same manner as the anodes.

.2 The live part of the reference electrodes should be cleared off to allow the reading of the structure potential.

.3 The reference electrodes should be properly calibrated before installation in the presence of Departmental Representative.

3.3 RECTIFIERS PREPARATION

.1 Rectifiers should be inspected by Contractor upon delivery in order to check whether they comply or not with the requirements.

.2 If changes are made by Contractor, the work must be made by qualified personnel. These modifications should be approved by the rectifiers manufacturer.

.3 The rectifiers should be CSA approved.

3.4 PROTECTION OF THE PUBLIC

.1 During the Work, Contractor must ensure that the public does not have any direct access to the hazardous areas. He must create protected working zones.

.2 All the electrical components must be installed so that the public cannot have access to any of them.

.3 Contractor must install the necessary posters, French and English, warning the public of the electrocution hazard.

3.5 OTHER INSTALLATIONS

.1 The other installations should be made according to the actual standards in force.

3.6 VERIFICATION OF THE ELECTRICAL INSTALLATION

.1 Before the beginning of the Work, Contractor must verify by his engineer that all the materials and the whole installation of the cathodic protection system comply with the Electrical Code requirements and with the good practice rules. The Work should be approved by a competent authority recognized in the province of Quebec. His recommendations will prevail on all documents supplied to Contractor.

.2 Once the system is installed, the electrical system inspection will be made by a competent authority in the province of Quebec. A certification will be given to Departmental Representative before the tests are made. It is specifically forbidden to connect the system before the certification is obtained and submitted to Departmental Representative. In case or rejection, the appropriate adjustments will be made by Contractor and the costs of such will be paid for by Contractor.

3.7 START-UP OF THE CATHODIC PROTECTION SYTEMS

.1 Once all the components of the impressed current cathodic protection system are installed, the Contractor must proceed with the system start-up.

.2 The Contractor must give technical assistance to the Departmental Representative for the start-up testing and allow the required time accordingly, to the utmost satisfaction of the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI C82.1-2004(R2013), Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 ANSI C82.4-2002, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
- .1 ANSI/IEEE C62.41-[1991], Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.
- .1 ASTM F 1137-[00(2006)], Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005-07, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

1.3 INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified.

.3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
- .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and, cleaning procedures.

1.4 QUALITY ASSURANCE

.1 Provide mock-ups in accordance with Section 01 45 00 - Quality Control.

1. 5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements].

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section [01 74 21 - Construction/Demolition Waste Management And Disposal].

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

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

.4 Fold up metal banding, flatten and place in designated area for recycling.

.5 Dispose of unused batteries at official hazardous material collections site approved by [Departmental Representative] [Consultant].

.6 Disposal and recycling of fluorescent lamps as per local regulations.

.7 Disposal of old PCB filled ballasts.

Part 2 Products

2.1 LAMPS

.1 As indicated in luminaire schedule.

2.2 BALLASTS

.1 As indicated in luminaire schedule.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.5 LUMINAIRES

.1 As indicated in luminaire schedule.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:
  .1 Install rigid conduit for luminaires as indicated.

3.3 LUMINAIRE ALIGNMENT

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
  .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 01 00 10 – General Instructions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CSA C22.2 No.141-15, Unit Equipment fo Emergency Lighting.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

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

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Consultant.

.5 Dispose of unused batteries at official hazardous material collections site approved by Consultant.

.6 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

.1 As indicated on luminaire schedule.

Part 3 Execution

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

END OF SECTION

DIVISION 31 – EARTHWORK

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 “Submittal Procedure”.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM).

.1 ASTM D 4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.2 NQ 2560-114, part II of BNQ.

1.3 SAMPLES

.1 The samples and certificates of conformance will be submitted as per section 01 33 00 “Submittal Procedure”.

.2 The necessary actions will be taken so that the Departmental Representative can take continuous aggregate samples during production.

.3 The General Contractor will pay for aggregate sampling and testing if the samples do not conform to the prescribed requirements.

Part 2 Products

2.1 MATERIALS

.1 Aggregate characteristics: Good quality, hard, resistant, free of stone needles and plates, soft particles or blades, organic matter, clumps of clay, minerals or other substances that may compromise the planned use.

.2 Stone plates and needles in coarse aggregates: in accordance with the provisions of the ASTM D 4791 standard.

.1 Elements where the largest surface is at least five times larger than the smallest surface.

.3 Fine aggregates that meet the requirements of the relevant sections will consist of one or a combination of the following materials:

.1 Natural sand;

.2 Manufactured sand;

.3 Stone dust from the crushing of quarry stone, roc, gravel or slag.

.4 Coarse aggregates that meet the requirements of the relevant sections will consist of one or a combination of the following materials:

.1 Crushed stone;

.2 Gravel and crushed gravel consisting of natural stone particles;

.3 Lightweight aggregates, including slag and expanded shale.

2.2 QUALITY CONTROL AT THE SOURCE

.1 The Departmental Representative will be informed of the proposed source of aggregates and will be allowed access for sampling purposes at least 4 weeks before production begins.

.2 If the Departmental Representative believes that the material from the proposed source of aggregates does not meet the prescribed requirements or that is cannot reasonably be prepared to meet said requirements, another source will be found or it will be demonstrated that the material in question may be prepared to meet the prescribed requirements.

.3 The Departmental Representative will be notified 4 weeks prior to any change regarding the source of the aggregates.

.4 Material accepted at the source may still be refused afterward if it does not meet the specified requirements, if the quality or properties of the material delivered are not consistent or if performance or behaviour at the site is not satisfactory.

Part 3 Execution

3.1 PREPARATION

.1 Aggregate preparation

.1 The aggregates will be prepared in a consistent manner using methods that will prevent contamination, segregation and degradation.

.2 If necessary, the aggregates will be mixed in order to obtain the prescribed grain size, particle shape or percentage of crushed particles. Only methods and material approved by the Departmental Representative will be used.

.3 The aggregates will be washed as needed so that they can meet the requirements of the specifications. Only material approved by the Departmental Representative will be used.

.4 In the presence of layered deposits, material and excavation methods that will produce homogenous and consistent aggregates will be used.

.2 Handling

.1 The aggregates will be handled and transported in such a way as to prevent segregation, contamination and degradation

.3 Stockpiling

.1 Unless otherwise indicated by the Departmental Representative, the aggregates will be stockpiled at the construction site, where indicated. Aggregates will not be deposited in piles on paved surfaces.

.2 A sufficient amount of aggregates will be stockpiled so that the work schedule will be respected.

.3 The aggregates will be deposited in piles in well drained, stable and level areas with the appropriate bearing capacity to support the stockpiled material, as well as the handling equipment.

.4 Unless the materials are deposited in piles in an acceptable stabilized area, the base of the pile will consist of a bed of compacted sand at least 300 mm thick. However, this bed will not be incorporated to the material.

.5 In order to avoid mixing the aggregates, the various stockpiles will be sufficiently spaced or separated using strong walls the full height of the stockpiles.

.6 Using mixed or contaminated material is not permitted. The rejected materials will be removed and disposed of within 48 hours following their rejection, as instructed by the Departmental Representative.

.7 The material will be deposited in piles in even layers, the thickness of which will be in accordance with the following prescriptions:

.1 Coarse aggregates and material for the stockpile's bed: no more than 1.5 m;

.2 Fine aggregates and material for sub-base: no more than 1.5 m;

.3 All other materials: no more than 1.5 m.

.8 The aggregates delivered to the site by truck will be unloaded in even piles and deposited into piles in accordance with the prescriptions.

.9 Creating conical shaped piles or letting material slide down the side of the piles is not permitted.

.10 Stacking conveyors will not be used.

.11 During work in winter, actions will be taken to keep ice and snow from mixing with the stockpiled material or material removed from the stockpile.

3.2 CLEANING

.1 The areas where the aggregates have been deposited into piles will be cleaned so that the area will be tidy, well drained and free of any accumulation of stagnant water.

.2 Unused aggregates will be carefully deposited into compact piles, as instructed by the Departmental Representative.

.3 When the aggregate supply site will temporarily or permanently abandoned, it will be restored to the satisfaction of the appropriate authorities.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

.1 The cost associated with 2nd class excavation is not included in the cost of the structures for which the work will be performed.

.2 Excavated rock will measured based on volume, i.e. the volume of material actually removed, in accordance with the following:

.1 Based on the width of the excavation indicated.

.2 The width of the excavation indicated for the structures is established based on the vertical plans parallel to the exterior faces of the footings and located 500 mm at the most from the footings, as indicated.

.3 Based on the depth separating the surface of the rock mass immediately before excavation and the spot elevation indicated.

.4 If the elevation prescribed is located less than 300 mm below the initial elevation of the rock mass, the excavation depth is still established at 300 mm below the initial spot elevation of the rock mass for the purpose of this project.

.5 The volume of each block of rock or rock fragment is determined based on the three largest measured dimensions of three mutually perpendicular planes.

.3 Bulkheads and shoring, bridging, underpinning and dewatering structures will not be measured for payment as their cost is included in the cost of the structures for which they will be installed.

.4 The cost of filling of the excavation up to the required elevations is included in the price submitted for the structures in question.

.5 The placement of topsoil is measured in square metres of material, in accordance with the cross profiles established at the original site. A minimum depth of 100 mm of topsoil will be placed.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C 117-04, Standard Test Method for Material Finer than 0,075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 422-63 2002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D 698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ^{3}) (600 kN-m/m^3).

.5 ASTM D 1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D 4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Canada Green Building Council (CBDCa)

.1 LEED Canada-NC, version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green rating system for new Construction and Major Renovations (reference kit) (including 2007 addendum).

.2 LEED Canada-CI, version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green rating system for commercial interiors.

.4 Canadian Standards Association (CSA)/CSA International

.1 CAN/CSA-A3000-F03, Cementitious materials compendium (Contains A3001, A3002, A3003, A3004 and A3005).

.2 CSA-A3001-F03, Cementitious Materials Used in Concrete.

.3 CSA-A23.1/A23.2-F04, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.

.5 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock excavation: Excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m^3. Frozen material not classified as rock.

.2 Common excavation (2nd class): Excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in work.

.3 Topsoil

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Any material reasonably free of subgrade, clumps of clay, shrubs, harmful weeds and other debris, and free of pebbles, stumps, roots and other unsuitable material more than 25 mm in size.

.4 Waste material: excavated material unsuitable for use in work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.6 Recycled excavation material: Material deemed to be inert from various sources and modified to meet the filling needs.

.7 Unsuitable materials

.1 Weak, compressible and chemically unstable materials.

.2 Frost susceptible materials

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C 136 and ASTM: Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2

.2 Table

Sieve Size	% passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse soil with a density higher than 20% when passing through the 0.075 mm sieve.

.8 Filling material dimensionally stable: low resistance material consisting of cement, concrete aggregates and water, which will not compact when placed in the trenches where utilities will be installed and where excavation may take place without preliminary preparation.

1.4 SUBMITTALS

.1 Submit documents and samples in accordance with the requirements of section 01 33 00 “Submittal Procedure”.

.2 Quality control: In accordance with 01 45 00 “Quality Control”.

.1 Submit a report on the existing conditions as defined in the item “Existing Conditions”.

.2 Submit details of proposed dewatering or heave prevention methods to the Departmental Representative for review, in accordance with Part 3 of this specification.

.3 Notify the Departmental Representative in writing of impending excavation at least seven (7) days prior to the beginning of excavation in order to ensure that the cross profiles have been established.

.4 Notify the Departmental Representative in writing when the bottom of the excavation is reached.

.5 Submit the test and inspection results and reports to the Departmental Representative in accordance with Part 3 of this section.

.3 Documents/samples to be submitted prior to beginning the work

.1 Prior to the beginning of the work described in this section, submit a list of the main pieces of equipment and materials that will be used.

.2 Submit the information regarding the location of buried utilities.

1.5 QUALITY ASSURANCE

.1 Certificate of competence: Submit a document certifying that an insurance policy was taken out to cover professional liability.

.2 Submit design and supporting data at least 2 weeks prior to commencing work.

.3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Canada, in the province of Quebec.

.4 Keep design and supporting data on site.

.5 Health and safety

.1 Take the necessary measures regarding occupational health and safety in accordance with section 01 35 29.06 “Health and Safety Requirements”.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

1.7 EXISTING CONDITIONS

.1 Become familiar with the geotechnical report.

.2 Buried services

.1 Before beginning work, verify location of buried services on and adjacent to site.

.2 Arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work; pay costs of relocating services.

.3 Remove and dispose of obsolete buried services and cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for informational purposes only. Completeness and accuracy are not guaranteed

.5 Prior to beginning excavation work, establish location and condition of buried utilities and structures, and notify Departmental Representative of findings.

.6 Confirm locations of buried utilities through careful test excavations.

.7 Maintain and protect identified water, sewer, gas, electric, telephone and other utilities and structures from damage, as indicated.

.8 Where utility lines or structures exist in area of excavation, obtain appropriate instructions from Departmental Representative before performing work.

.3 Existing surface features

.1 Conduct, with Departmental Representative, condition survey of buildings, trees and other plants, lawns, fencing, service poles, railroad tracks, wires, pavement, boundary markers and bench marks that could be affected by work

.1 Protect existing buildings and surface features from damage while work is in progress. In event of damage, repair immediately as directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Type MG-112 or CG-14 in accordance with section 31 05 16 “Aggregate Materials” and the following requirements.

.1 Stone, gravel or bank-run sand involving crushing or screening.

.2 Grain size within the range indicated during tests performed in accordance with the ASTM C 136 standard and sieve size in accordance with the CAN/CGSB-8.1 standard.

.3 Table

Sieve Size	**% Passing**		
	MG-112	**CG-14**	**MG-20[(1)]**
112 mm	100		
80 mm			
56 mm			
40 mm			
31.5 mm			100
20 mm		100	90-100
14 mm			68-93
5 mm	12-100	35-100	35-60
1.25 mm			19-38
315 µm			9-17
80 µm	0-10	0-10	2-8

[(1)] Crushed stone

.2 Filing materials: Unfrozen materials from the excavation or from another source authorized by the Departmental Representative for the use for which it is intended and free of stones with faces larger than 75 mm, clinker, ash, turf, waste or other detrimental materials.

.3 Dimensionally stable backfill: Proportioned and mixed in order to obtain the following characteristics.

.1 Maximum compressive strength: 0.4 MPa at 28 days.

.2 Maximum Portland cement content: 25 kg/m³, consisting of 40 % fly ash de used as replacement material in accordance with the CSA-A3001 standard, type 10.

.3 Minimum strength: 0.07 MPa at 24 hours.

.4 Concrete aggregate: In accordance with the CSA-A23.1/A23.2 standard.

.5 Concrete: Type 10.

.6 Slump: 160 to 200 mm.

.4 Geotextiles: in accordance with section 31 32 19.01 “Geotextiles”.

Part 3 Execution

3.1 EROSION AND SEDIMENT CONTROL

.1 Implement temporary erosion and sediment control measures in order to avoid the loss of soil resulting from runoff or wind and to keep the said soil from depositing on adjacent properties or pedestrian paths. These means of control will be implemented in accordance with the most stringent requirements included in the document entitled *EPA 832/R-92-005* published by the EPA and those of appropriate authorities.

.2 Inspect, maintain and repair the implemented means of control until permanent vegetation is established.

.3 Remove the implemented means of control and restore the surfaces disturbed during work.

3.2 SITE WORK

.1 Remove obstacles, snow and ice accumulated on the surface of the excavation area.

.2 Carefully saw off the pavement and sidewalks along the boundaries of the proposed excavation area so that the surface breaks off neatly and evenly.

3.3 PREPARATION /PROTECTION

.1 Protect existing features in accordance with Section 01 56 00 “Temporary Barriers and Enclosures » and applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative’s approval.

.4 Protect natural and man-made features that are to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

.1 Remove the topsoil. Do not mix topsoil with the material from the subsoil.

3.5 STOCKPILING

.1 Deposit the filling material in piles where indicated by the Departmental Representative.

.1 Deposit the aggregates in piles in such a way as to avoid segregation.

.2 Protect the materials against any contamination.

.3 Take the appropriate control measures to control erosion and sediments so that particles will not be deposited outside of the construction site’s boundaries and in water courses.

3.6 BULKHEADS, SHORING, BRIDGING AND UNDERPINNING

.1 The excavation walls will be protected through appropriate methods and in accordance with 01 35 29.06 “Health and Safety Requirements” and the Act Respecting Occupational Health and Safety (province of Quebec).

.1 When conditions are unstable, the Departmental Representative will make the necessary inspections and indicate the methods to be used.

.2 Build temporary structures at the necessary depth and height.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while work is in progress.

.2 Provide, for Departmental Representative’s review, details of proposed dewatering or heave prevention methods, such as the installation of dykes, well points, and sheet piles cur off.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 Prevent bottom heave of excavations or piping heave by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 “Environmental Procedures” to approved runoff areas and in manner not detrimental to public and private property, or portion of work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.8 EXCAVATING

.1 Advise Departmental Representative at least seven days in advance of excavation operations so that initial cross sections can be taken.

.2 Excavate based on the dimensions, needs and marks indicated on the plans.

.3 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.4 Restrict vehicle operations directly adjacent to open trenches.

.5 Dispose of surplus and unsuitable excavated material in approved location.

.6 Do not obstruct flow of surface drainage or natural watercourses.

.7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.8 Notify Departmental Representative when bottom of excavation is reached.

.9 Obtain Departmental Representative approval of completed excavation.

.10 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.11 Correct unauthorized over-excavation as instructed by the Departmental Representative.

.12 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.13 Install geotextiles in accordance with Section 31 32 19.01 “Geotextiles”.

3.9 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698.

.1 Outside of the peripheral walls of the building: Fill up to the elevation of the subgrade with type 3 material compacted up to 95% of the corrected maximum dry density.

.2 Place unshrinkable fill in areas as indicated.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated on the plans.

.2 Place bedding and surround material in unfrozen condition.

.3 Compact material to 95% of the maximum dry density under consideration.

3.11 BACKFILL

.1 Do not proceed with backfilling operations until:

.1 Departmental Representative has inspected and approved installations.

.2 Departmental Representative has inspected and approved of construction below finish grade.

.3 Inspection, testing, approval, and recording location of underground utilities.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place the backfill material in even layers that will not exceed a depth of 200 mm after compaction, up to the elevations indicated. Compact each layer before placing the next layer.

.5 Backfilling around structures

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or above cast-in-place concrete structures within 24 hours following concrete placement.

.3 Place layers simultaneously on both sides of installed work to equalize loading. The height difference between the embankments will not exceed 100 mm.

.4 If the material is likely to apply lateral loads on the walls or other structures, use either one of the methods below.

.1 Let the concrete harden for at least fourteen (14) days or wait until it is strong enough to withstand the loads applied to the embankment and from compaction, and until it has been inspected by the Departmental Representative.

.6 Consolidate and level the dimensionally stable embankments using internal vibrators.

3.12 RESTORATION

.1 Upon completion of work, remove waste materials and debris in accordance with section 01 74 21 “Construction/Demolition Waste Management and Disposal”, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil as indicated or as directed by Departmental Representative.

.3 Restore lawns to elevation that existed before excavation.

.4 Clean and restore areas affected by work as directed by Departmental Representative.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

.1 No measurement for payment will be made under this Section.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 "Construction/Demolition Waste Management and Disposal"

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

Part 2 Products

2.1 MATERIALS

.1 Abrasives and solvents used for removal of paint, oil, grease, rubber deposits: proprietary products specially designed for pavement cleaning, subject to approval by the Departmental Representative.

Part 3 Execution

3.1 NOT APPLICABLE

.1 Not applicable.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 16 “Aggregate Materials”.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.5-M91 (March 1999), Low Flash Petroleum Spirits Thinner (December 1991).

.2 CAN/CGSB-1.74-2001, Alkyd Traffic Paint.

.3 “Ministère des Transports, de la Mobilité durable et de l’Électrification des transports” (Quebec government authority on transportation).

.1 “Cahier des charges et devis généraux” (CCDG) 2016.

1.3 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 “Submittal Procedures”.

.2 Submit samples of material for sieve analysis to the Departmental Representative and CDC Representative at least two (2) weeks before beginning work.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove all packing material and bring them to appropriate recycling facilities.

.3 Place materials defined as toxic or hazardous in containers designated for this purpose.

Part 2 Products

2.1 MATERIALS

.1 Aggregates: In accordance with section 13 of the “Cahier des charges et devis généraux” (CCDG) of the “Ministère des Transports, de la Mobilité durable et de l’Électrification des transports” (the Quebec government authority on transportation).

.2 Aggregates: In accordance with the provisions of the CCDG and section 31 23 33.01.

.1 Crushed stone MG 20.

.2 Natural gravel MG-112.

.3 Gravel and sand.

.3 Asphalt concrete: In accordance with the CCDG (section 13), type ESG-14 with PG58-34 hot mix.

.4 Granular base: MG 20 crushed stone, section 31 23 33.01.

Part 3 Execution

3.1 ROAD FOUNDATIONS

.1 Road foundations will include the following layers:

.1 Subbase: Consisting of MG-112 aggregate, 450 mm thick after compaction.

.2 Granular base course: Consisting of MG-20 crushed stone, 150 mm thick after compaction.

.2 The granular courses will be constructed in accordance with the provisions of the CCDG.

3.2 PAVEMENT THICKNESS

.1 Pavement 80 mm thick.

.2 Unique ESG-14 course.

3.3 PAVEMENT CONSTRUCTION

.1 Asphalt concrete: in accordance with section 13 of the “CCDG”.

.2 Surface preparation: in accordance with the provisions of the “CCDG”.

.3 Application of the tack coat: in accordance with the provisions of the “CCDG”..

.4 Construction of the asphalt concrete: in accordance with the provisions of the “CCDG”.

END OF SECTION

APPENDIX "A"

**Geotechnical Investigation Report
Expansion of the Tank Room and
Construction of a New Water Intake
Institue Maurice-Lamontagne
Sainte-Flavie, Quebec
July 2001**

TRAVAUX PUBLICS ET SERVICES
GOUVERNEMENTAUX CANADA

ÉTUDE GÉOTECHNIQUE

Agrandissement de la salle des bassins et
construction d'une nouvelle prise d'eau
Institut Maurice-Lamontagne
Sainte-Flavie, Québec

N/D : 201511

Présenté par :

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Juillet 2001

GÉNILAB BSLG / GÉNI-ENVIRONNEMENT / GÉNIVIT EXPERTS / GÉNIGROUPE INTERNATIONAL

GÉNIGROUPE INC.

ISO 9002

Siège social : 192 montée Industrielle et Commerciale, Rimouski (Québec) G5M 1A5 CANADA
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Rimouski, le 12 juillet 2001

Monsieur Jean-Luc Mathieu, ing.
Travaux publics et Services gouvernementaux Canada
180, de la Cathédrale
Rimouski (Québec) G5L 5H9

PROJET : Agrandissement de la salle des bassins et construction d'une nouvelle prise d'eau
Institut Maurice-Lamontagne
Sainte-Flavie, Québec
OBJET : Étude géotechnique
N/D : 201511

Monsieur,

Pour faire suite au mandat que vous nous avez confié, il nous fait plaisir de vous transmettre notre rapport concernant l'étude géotechnique réalisée dans le cadre du projet mentionné en rubrique.

Si des informations supplémentaires vous étaient nécessaires, n'hésitez pas à communiquer avec nous.

Veuillez accepter, Monsieur, l'expression de nos sentiments les meilleurs.

GÉNIGROUPE INC.

Jean Crépault, ing.
Directeur général

JC/cl

p.j.

TABLE DES MATIÈRES

TABLE DES MATIÈRES (SUITE)

Distribution : Cinq (5) copies : Monsieur Jean-Luc Mathieu, ing.
TRAVAUX PUBLICS ET SERVICES
GOUVERNEMENTAUX CANADA

1.0 INTRODUCTION

Les services de la firme GÉNIGROUPE INC. (Génilab BSLG), consultants en géotechnique et en contrôle des matériaux, ont été retenus par Travaux publics et Services gouvernementaux Canada (TPSGC) pour effectuer une étude géotechnique dans le cadre de l'agrandissement d'une salle de bassins et de la construction d'une nouvelle prise d'eau à l'Institut Maurice-Lamontagne de Sainte-Flavie.

Le mandat initial comportait la réalisation de cinq (5) forages aux emplacements déterminés par TPSGC. Par la suite, il a été convenu avec Monsieur Jean-Luc Mathieu, ingénieur de TPSGC, de réaliser trois (3) forages et de compléter le mandat par un relevé cartographique du socle rocheux le long de la nouvelle prise d'eau.

La reconnaissance sur le terrain ainsi que l'étude qui l'a suivie avaient pour but d'obtenir une information géotechnique précise à l'emplacement prévu pour la construction de la nouvelle section du bâtiment et pour la mise en place de la prise d'eau de mer.

On trouvera, dans les pages qui suivent, les informations relatives à la méthode de reconnaissance suivie sur le chantier, ainsi que les résultats des essais réalisés au chantier et en laboratoire. Ce rapport contient également notre interprétation des données recueillies, ainsi que nos commentaires et recommandations jugés pertinents.

2.0 DESCRIPTION DU PROJET ET DU SITE A L'ÉTUDE

2.1 Description du projet

Le projet consiste en l'agrandissement de la salle des bassins de l'Institut Maurice-Lamontagne à Sainte-Flavie. La nouvelle section du bâtiment se trouvera à l'est de la salle existante. Au moment de la rédaction de ce rapport, aucune information concernant le bâtiment prévu, le type de fondation, leur niveau d'implantation et les charges qu'elles transmettront aux matériaux en place ne nous a été transmise.

Le projet inclut également la construction d'une nouvelle prise d'eau de mer à partir de cette nouvelle section du bâtiment jusqu'à la rive du fleuve Saint-Laurent. Le niveau d'implantation de cette conduite est de –3,0 m sous le niveau des basses eaux, et nécessitera la réalisation d'une tranchée dans le roc. Il fut mentionné par le représentant de TPSGC que le long du tracé de la prise d'eau prévue, l'excavation du socle rocheux sera au maximum de 0,5 m de profondeur.

2.2 Description du site à l'étude

Le site à l'étude se trouve à Sainte-Flavie, sur le site actuel de l'institut Maurice-Lamontagne. Plus précisément, l'emplacement du futur agrandissement se trouve à l'est de la salle des bassins existante.

Quant à la future prise d'eau, elle est perpendiculaire au tracé du fleuve Saint-Laurent.

À l'emplacement prévu pour la nouvelle section du bâtiment, le relief du terrain est plat et sa surface est asphaltée. Le long du tracé prévu pour la prise d'eau, le relief est en pente et la surface est constituée du socle rocheux, et visible à marée basse.

3.0 MÉTHODE DE RECONNAISSANCE

3.1 Travaux de chantier

Les travaux de chantier ont consisté en la réalisation de trois (3) forages (F-1 à F-3) ayant atteint une profondeur respective de 4,27, 3,35 et 2,30 m.

Les forages ont été réalisés à l'aide d'une foreuse à avancement hydraulique de marque Mobil Drill, modèle Acker B-79. Tout au long de l'avancement des forages, des échantillons du mort-terrain ont été prélevés à l'aide d'une cuillère fendue de calibre BW, ce qui a permis la détermination des indices « N » de densité relative des sols en place. Des échantillons du socle rocheux ont aussi été prélevés à l'aide d'un carottier aux diamants de calibre NQ.

La localisation des forages a été effectuée selon les indications de Travaux publics et Services gouvernementaux Canada. Le relevé de nivellement des forages a été effectué par les arpenteurs de TPSGC. Les plans de localisation à l'annexe I montrent l'emplacement des forages effectués.

3.2 Travaux de laboratoire

Les échantillons prélevés à l'intérieur des sondages ont été acheminés à nos locaux afin d'être identifiés visuellement par notre personnel de laboratoire.

L'identification en laboratoire a été complétée par deux (2) essais en compression sur le socle rocheux. Le résultat des essais est présenté à l'annexe III.

Les spécimens non analysés seront conservés dans nos locaux jusqu'à la fin du mois de juillet 2002, date à laquelle ils seront détruits, à moins d'indication contraire de la part des représentants de Travaux publics et Services gouvernementaux Canada.

4.0 DESCRIPTION DES SOLS

Sous ce chapitre, nous présentons une description de la nature et des propriétés des sols à l'endroit des forages réalisés. Vous trouverez à l'annexe II les rapports de forages.

4.1 Emplacement du futur agrandissement

L'emplacement du futur agrandissement a été investigué à l'aide des forages F-1 et F-2.

4.1.1 Béton bitumineux

Une couche de béton bitumineux d'une épaisseur de 7,0 cm a été rencontrée en surface à l'endroit des forages F-1 et F-2.

4.1.2 Sable, un peu de gravier à graveleux, traces de silt

Par la suite, sous le béton bitumineux, une couche de sable avec un peu de gravier à graveleux et traces de silt a été traversée. L'épaisseur de cette couche à l'endroit des forages F-1 et F-2 est respectivement de 1,78 et 0,62 m.

Selon les indices « N » de densité relative relevés à l'intérieur de cette couche, sa densité peut être qualifiée de dense.

4.1.3 Socle rocheux

Finalement, sous la couche de sable, les forages F-1 et F-2 ont rencontré le socle rocheux aux profondeurs respectives de 1,85 m et 0,69 m. La description détaillée du roc est présentée à l'annexe II.

Avec les carottes de forages récupérées, les indices de qualité du roc (R.Q.D.) relevés à l'intérieur des forages F-1 et F-2 varient de 0 à 50 %. Donc, selon le Manuel canadien d'ingénierie des fondations, le socle rocheux est qualifié de très mauvaise qualité en surface et augmente à mauvaise qualité un peu plus en profondeur.

Un (1) essai de résistance en compression a été réalisé sur un échantillon provenant du socle rocheux. Le résultat est présenté au tableau suivant.

Tableau 4.1.3
Résultat – Essai de résistance en compression

Échantillon no	Profondeur (m)	Résistance en compression (MPa)
F-2/CR-2	2.40	27.6

4.2 Emplacement de la future prise d'eau

L'emplacement de la future prise d'eau a été investigué à l'aide du forage F-3. Le tracé de la prise d'eau a aussi fait l'objet d'un relevé cartographique.

Le socle rocheux a été rencontré en surface à l'endroit du forage F-3. À cet emplacement précis, le socle rocheux est identifié comme étant un schiste argileux de couleur noire.

Selon les indices de qualité du roc (R.Q.D.) relevés à l'intérieur du forage F-3, la qualité du socle rocheux varie encore une fois entre 0 et 50 %. Le Manuel canadien d'ingénierie des fondations identifie donc ce socle rocheux comme étant de très mauvaise à mauvaise qualité.

Un (1) essai de résistance en compression a été réalisé sur un échantillon provenant du socle rocheux. Le résultat est présenté au tableau suivant.

Tableau 4.2.1
Résultat – Essai de résistance en compression

Échantillon no	Profondeur (m)	Résistance en compression (MPa)
F-3/CR-2	0.90	23.2

5.0 COMMENTAIRES ET RECOMMANDATIONS

5.1 Généralités

Les commentaires et recommandations émis dans ce rapport sont basés sur notre compréhension actuelle du projet ainsi que sur les résultats des forages réalisés, ces derniers représentant un échantillonnage ponctuel du site. Les conditions de sol rencontrées sont par la suite présumées représentatives de l'ensemble de la stratigraphie du site.

Les recommandations présentées découlent aussi du programme d'essais de laboratoire entrepris lors de la présente étude, ainsi que de la cartographie du socle rocheux réalisée.

Par conséquent, si les conditions rencontrées lors des travaux différaient de celles observées aux emplacements des sondages, nous devrions en être informés afin de pouvoir modifier nos recommandations en conséquence (voir conditions générales et limitations à la fin du rapport).

De plus, toute modification majeure au projet ayant des conséquences au point de vue géotechnique devrait nous être soumise afin que nous puissions réviser, confirmer ou modifier, selon le cas, les recommandations émises dans ce rapport.

5.2 Description du projet

Le projet consiste en l'agrandissement de la salle des bassins de l'Institut Maurice-Lamontagne à Sainte-Flavie. La nouvelle section du bâtiment se trouvera à l'est de la salle existante. Au moment de la rédaction de ce rapport, aucune information concernant le type de fondation, leur niveau d'implantation et les charges qu'elles transmettront aux matériaux en place ne nous a été transmise.

Le projet inclut également la construction d'une nouvelle prise d'eau de mer à partir de cette nouvelle section du bâtiment jusqu'à la rive du fleuve Saint-Laurent. Le niveau d'implantation de cette conduite est de –3,0 m sous le niveau des basses eaux, et nécessitera la réalisation d'une tranchée dans le roc. Selon les informations reçues, l'excavation sera de l'ordre de 0,5 m de profondeur.

5.3 Futur agrandissement

5.3.1 Fondations et capacité portante

Dans le cas actuel, au moins deux (2) solutions pourront être envisagées pour établir les fondations du futur bâtiment.

Dans tous les cas, on aura avantage à utiliser le même principe de

fondation que celui utilisé pour le bâtiment contigu actuel. Si l'on prévoit un comportement différentiel entre la nouvelle construction et le bâtiment actuel, on aura avantage à prévoir des joints de construction appropriés.

Première solution :

Égaliser le socle rocheux et l'aplanir si nécessaire pour avoir une surface horizontale ou en marche d'escalier. Pour ce faire, nous recommandons de procéder de la façon suivante :

- Excaver les matériaux en place et le socle rocheux jusqu'à l'élévation voulue. Enlever toute particule détachée ou non attachée solidement ;
- Si le fond des excavations présente des aspérités ou des inégalités, régaler et remplir la surface avec un béton maigre.

Une capacité portante admissible de 300 kPa pour une charge centrée et verticale pourra être utilisée pour la conception des fondations, moyennant les recommandations ci-haut émises.

De plus, comme les fondations ne seront pas à 2 m de profondeur, elles ne seront pas préservées du gel. Afin de contrer l'effet du gel sur les fondations, il sera nécessaire d'avoir recours à de l'isolant.

Deuxième solution :

Afin de contrer les effets de la pénétration du gel dans le sol et d'offrir une capacité portante adéquate, il sera également possible de mettre en place les fondations à 2,25 m de profondeur sous la surface du terrain, dans le socle rocheux. Pour ce faire, nous recommandons de procéder de la façon suivante :

- Excaver les matériaux en place et le socle rocheux jusqu'à 2,25 m de profondeur. Enlever toute particule détachée ou non attachée solidement ;
- Si le fond des excavations présente des aspérités ou des inégalités, régaler et remplir la surface avec un béton maigre.

Une capacité portante admissible de 900 kPa pour une charge centrée et verticale pourra être utilisée pour la conception des fondations, moyennant les recommandations ci-haut émises.

De plus, afin vérifier si l'assise des fondations correspond à celle que nous avons supposée lors de l'interprétation des sondages, nous recommandons que le fond d'excavation découvert au niveau des empattements soit inspecté par un de nos ingénieurs géotechniciens lors des travaux et ce, avant toute mise en place du béton et des remblais.

5.4 Future prise d'eau

5.4.1 Ancrages

Pour la conception des ancrages de la future prise d'eau dans le socle rocheux, nous recommandons l'utilisation des paramètres suivants :

- Capacité portante du socle rocheux :
  - 0,7 MPa (pour une charge centrée et verticale) ;
- Contrainte d'adhérence admissible :
  - 0,25 MPa ou 1/30 de la résistance en compression du coulis.

La capacité des ancrages devra être confirmée par des essais d'arrachement avant la mise en service de l'ouvrage (charge d'essai minimale = 1,33 fois la charge de service).

5.5 Excavations

Pour atteindre le niveau recommandé pour la mise en place des fondations du bâtiment et de la prise d'eau, les excavations devront être réalisées dans le sable avec un peu de gravier à graveleux et traces de silt, et/ou principalement dans le socle rocheux.

Malgré qu'à l'emplacement des forages, la qualité du socle rocheux est qualifiée de très mauvaise à mauvaise. L'entrepreneur devra prévoir l'utilisation d'une machinerie de capacité suffisante ou toute autre méthode jugée adéquate pour atteindre le niveau prévu pour la mise en place des fondations du bâtiment et de la prise d'eau.

Tel que déjà mentionné, une cartographie géologique fut réalisée sur l'axe prévu pour la conduite. Les résultats observés sont les suivants :

1) <u>de la grève au forage F-3 (longueur 34.4 m)</u>

   Sur toute la longueur de cette portion d'axe, on retrouve toujours un schiste vert ou noir avec un seul plan de schistosité de direction variant entre 42 ° et 80 ° avec un pendage de 74° E à 45°E.

2) <u>du forage F-3 au point repère P4 (longueur 95 m)</u>

   Sur la longueur de cette portion d'axe, on retrouve toujours un schiste vert ou noir avec un seul plan de schistosité de direction variant entre 40° et 80° et dont le pendage subvertical varie entre 45°E et 80°E.

3) <u>du point de repère P4 vers la mer (longueur 50 m)</u>

   On retrouve encore un schiste vert ou noir avec un seul plan de schistosité de direction variant entre 44° et 82° et dont le pendage

subvertical varie entre 48°E et 82°E.

Selon notre avis, l'énergie nécessaire à déployer pour creuser le socle rocheux sur une profondeur de 0,5 m sera obtenue avec l'emploi d'au moins un marteau pneumatique. Il est à noter qu'à marée haute, la majeure partie de l'axe prévu pour la conduite est immergée.

Rappelons qu'en tout temps les pentes des parois d'excavation à l'endroit du bâtiment devront être conformes aux exigences de la Commission de la Santé et Sécurité au Travail du Québec (C.S.S.T.). Comme il s'agit de pentes temporaires, l'entrepreneur est responsable de leur stabilité ainsi que de la sécurité des travailleurs, de l'ouvrage à construire et des structures existantes quand cette sécurité dépend des pentes temporaires.

5.6 Matériaux de remblaiement et coefficient de poussée des terres au repos

Les matériaux de remblaiement autour des murs devraient être choisis pour minimiser la pression latérale que les murs peuvent supporter et, pour rejoindre cet objectif, un bon matériau de remblai doit avoir une résistance au cisaillement stable dans le temps, donc exempt de fluage et une excellente perméabilité. En général, les sables et graviers sont de bons matériaux de remblaiement

puisqu'ils ont une perméabilité élevée et qu'ils peuvent maintenir indéfiniment un état actif de contrainte sous un déplacement ou une rotation minimum.

Lorsqu'un tel matériau est compact, alors le concepteur peut considérer lors de ses calculs, un coefficient de poussée des terres au repos équivalant à 0,45 ($K_0 = 0,45$).

Le remblayage des fondations pourra être effectué, de façon générale, avec un emprunt granulaire mise en place par couches de 300 mm d'épaisseur maximale. Le compactage devra être effectué à 95 % de la valeur maximale du Proctor modifié.

5.7 Réutilisation des matériaux

Les matériaux excavés seront principalement composés de béton bitumineux, de matériaux granulaires avec traces de silt, et de cailloux et blocaux provenant du socle rocheux.

Seuls les matériaux granulaires avec traces de silt pourront être réutilisés pour le remblayage des murs de fondation, à condition qu'ils soient exempts de tous débris, matières organiques ou végétales, et qu'ils respectent les exigences du devis du concepteur.

En ce qui concerne les matériaux constitués de morceaux de roc, ils pourront être réutilisés pour le remblayage de la prise d'eau.

5.8 Drainage

Nous recommandons d'installer un système de drainage en périphérie des fondations de l'agrandissement afin de capter et d'évacuer hors du site les eaux d'infiltration. Ceci afin de contrôler l'accumulation d'eau de façon permanente au voisinage des fondations.

6.0 PERSONNEL TECHNIQUE ET PROFESSIONNEL

Pour l'étude géotechnique faisant l'objet de ce rapport, les travaux de terrain ont été effectués par Monsieur Guido Bérubé, technicien senior.

Les analyses de laboratoire ont été effectuées par notre personnel technique de laboratoire, sous la supervision de Monsieur Viateur Moisan, technicien senior.

Monsieur Pierre Boisjoli, ingénieur senior, a réalisé la cartographie géologique ainsi que la description des carottes rocheuses.

Monsieur Jean Crépault, ingénieur senior, a supervisé toutes les opérations de chantier, dirigé l'étude subséquente, interprété les résultats et avec l'aide de Madame Annie-Hélène Bellavance, ingénieure, a rédigé le présent rapport qui a fait, par la suite, l'objet d'une vérification de la part de l'équipe géotechnique de GÉNIGROUPE INC. (Génilab BSLG).

GÉNIGROUPE INC.

Annie-Hélène Bellavance, ing.

Jean Crépault, ing.

AHB/JC/cl

p.j.

GÉNILAB BSLG INC.

CONDITIONS GÉNÉRALES ET LIMITATIONS DU PRÉSENT RAPPORT D'ÉTUDE

A UTILISATION DU RAPPORT

Les données factuelles, les interprétations et les recommandations contenues dans ce rapport se rapportent à un projet spécifique tel que décrit dans le rapport et ne s'appliquent à aucun autre projet, ni autre site. Si le projet est modifié du point de vue conception, emplacement ou élévation, ou encore si le projet n'est pas commencé dans les six (6) mois de la date du rapport, GÉNILAB BSLG INC. devrait être consultée de façon à confirmer que les recommandations déjà données sont encore valides.

Les commentaires donnés dans ce rapport n'ont pour but que de servir de guide à l'ingénieur en conception. Le nombre de sondages pour déterminer toutes les conditions souterraines pertinentes qui peuvent affecter les coûts de construction, le choix des techniques et du matériel de chantier, ainsi que le calendrier et la séquence des travaux, devrait normalement être plus élevé que celui exécuté pour les besoins de la conception. Les entrepreneurs qui soumissionnent ou qui exécutent le travail devraient compter sur leurs propres études ainsi que sur leurs propres interprétations des résultats factuels des sondages pour déterminer de quelle façon les conditions souterraines peuvent affecter leur travaux.

B SUIVI DE L'ÉTUDE ET DES TRAVAUX

Tous les détails de conception et de construction peuvent ne pas être connus au moment de la soumission du rapport de GÉNILAB BSLG INC. Il est donc recommandé que les services de GÉNILAB BSLG INC. soient retenus pendant l'étape finale de la conception de façon à réviser les dessins de conception et les spécifications se rapportant aux fondations, aux travaux de terrassement, aux systèmes de retenue des terres et au drainage, afin de vérifier s'ils sont consistants du point de vue géotechnique avec le rapport de GÉNILAB BSLG INC.

Il est recommandé que les services de GÉNILAB BSLG INC. soient retenus pendant la construction pour confirmer et établir que les conditions souterraines, sur toute l'étendue du site, ne diffèrent pas de celles données dans le rapport de GÉNILAB BSLG INC., et pour confirmer et établir que les travaux de construction n'ont pas eu un effet défavorable sur l'intention des recommandations du rapport.

C CONDITIONS DU SOL ET DU ROC

Les descriptions des sols et du roc données dans ce rapport proviennent de méthodes de classification et d'identification communément acceptées et utilisées dans la pratique professionnelle de la géotechnique. La classification et l'identification du sol et du roc nécessitent un jugement et GÉNILAB BSLG INC. ne garantit pas que les descriptions sont exactes, mais assure une précision seulement à ce qui est communément utilisé dans la pratique géotechnique courante.

D PLANS ET DEVIS

L'étude géotechnique ne constitue pas et ne remplace pas les plans et devis de l'ouvrage. Dans tous les cas de litige ou d'interprétation, les plans et devis priment sur l'étude géotechnique.

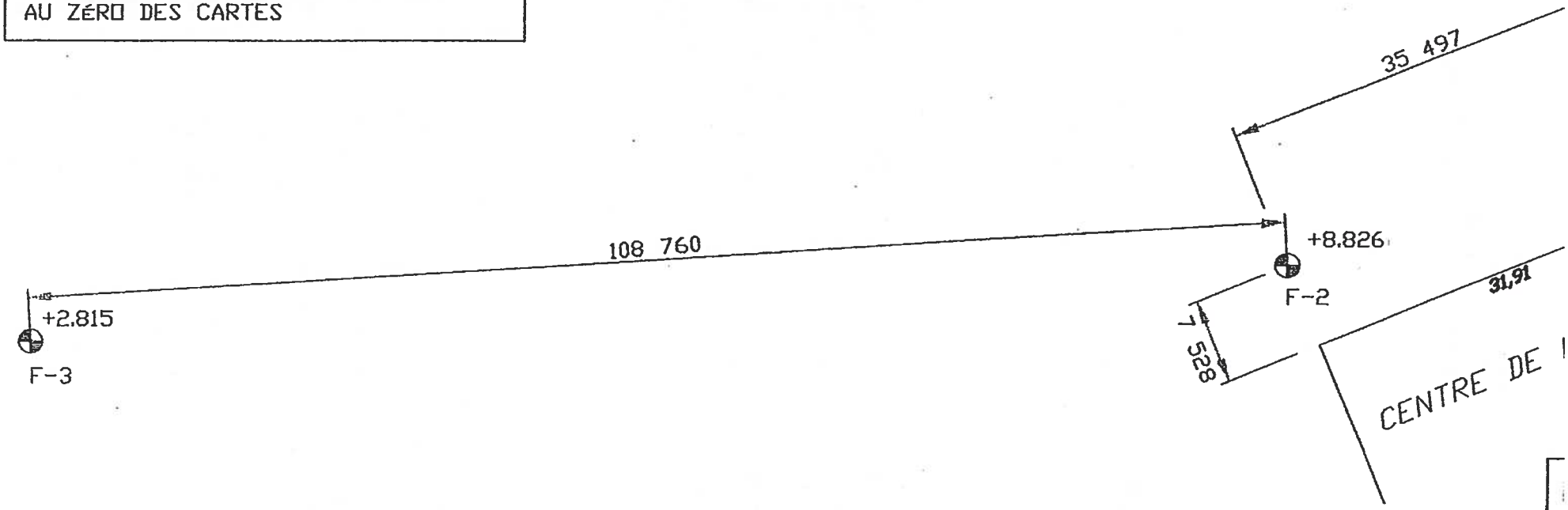
E ENVIRONNEMENT

Les lois et règlements environnementaux peuvent affecter le coût, la réalisation et le cheminement du projet. Les aspects environnementaux n'étant pas couverts par ce rapport, le concepteur et/ou le réalisateur du projet devront s'enquérir de ces lois et règlements et leurs amendements ultérieurs avant d'exécuter ce projet.

ANNEXE I

Plan de localisation

COORDONNÉES NAD 1983 MTM		
FORAGE	NORD	EST
F-3	5 389 470.791	256 508.793
ÉLÉVATIONS PAR RAPPORT AU ZÉRO DES CARTES		



PLAN DE LOCALISATION

0 25 m 1:500

ANNEXE II

Rapports de forages

GÉNIGROUPE
GÉNIGROUPE INTERNATIONAL
GÉNILAB BSLG
GÉNILAB ENVIRONNEMENT
GÉNIVIT EXPERT
ISO 9002

RAPPORT DE FORAGE

DOSSIER No.: 201511
PROJET: Bâtiment des bassins et app. en eau
ENDROIT: IML, Sainte-Flavie

FORAGE No.: F-1
DATE DU FORAGE: 01-06-18
TECHNICIEN: Guido Bérubé, Tech.
MARTEAU: 63.5 CHUTE: 0.76 TUBAGE:

ÉCHANTILLONAGE ET ESSAIS AU CHANTIER | **ESSAIS EN LABORATOIRE**

TYPES D' ÉCHANTILLONNEURS

CF : CUILLIÈRE FENDUE STD
TS : TUBE SHELBY
PS : ÉCHANTILLONNEUR À PISTON
CD : CAROTTIER À DIAMANTS, CALIBRE
WS/AS : ÉCHANTILLON PAR LAVAGE / À LA TARIÈRE

ÉTAT DE L'ÉCHANTILLON:

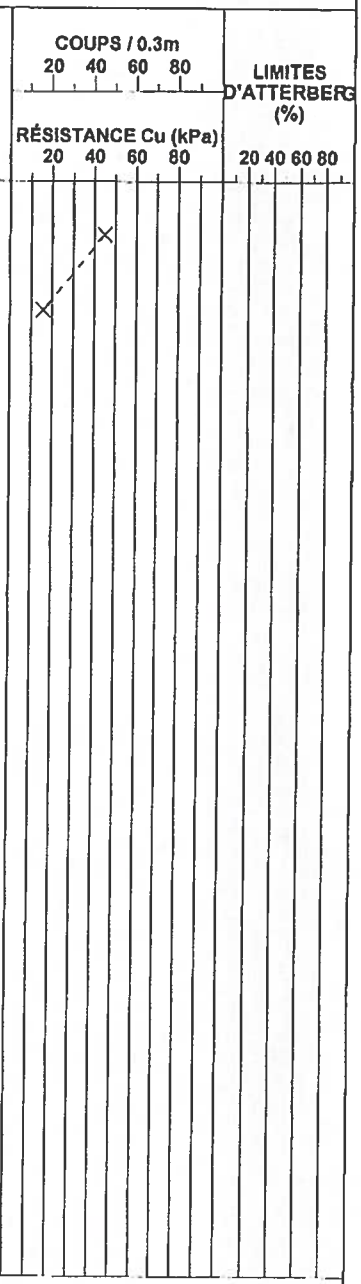
REMANIÉ NON REMANIÉ PERDU CAROTTÉ

TYPES ET RÉSULTATS D' ESSAIS:

VT : SCISSOMÈTRE
PT : PÉNETROMÈTRE
PM : PRESSIOMÈTRE MENARD
N : INDICE DE PÉNÉTRATION STD. (COUPS / 0.3 M)
K : PERMÉABILITÉ
▼ : NIVEAU D'EAU SOUTERRAIN
CU/CUR : CISAILLEMENT SOL INTACT / SOL REMANIÉ
PL : PRESSION LIMITE (kPa)

AG : ANALYSE GRANULOMÉTRIQUE
ϑ : POIDS UNITAIRE HUMIDE (KN/m3)
U : COMPRESSION SIMPLE (Kpa)
Q : TRIAXIAL N.C. N.D. (kPa)
(%) : DÉFORMATION À LA RUPTURE
VL : SCISSOMÈTRE DE LABORATOIRE
C : CONSOLIDATION
⊢ LIMITE DE PLASTICITÉ (%)
O TENEUR EN EAU NATURELLE (%)
⊣ LIMITE DE LIQUIDITÉ (%)

Élév. (m)	PROF (m)	DESCRIPTION	Strat.	NIVEAU D'EAU	ÉCHANTILLONS TYPE ET No.	ÉTAT	REC. %	N	ESSAIS
9.92		surface du terrain							
9.85 / 0.07		Béton bitumineux							
	1	Sable ,traces de silt, un peu de gravier à graveleux, brun. Densité: dense			CF-1		67	--- N=45	
					CF-2		57	--- N=16	
8.07 / 1.85	2	Roc grès de qualité très mauvaise à mauvaise.			CF-3		78		
	3				CF-4		95		RQD 0%
	4				CF-4A		95		RQD 50%
5.65 / 4.27		Arrêt du forage à 4,27 m de profondeur.							
	5								
	6								
	7								
	8								
	9								
	10								



EFFECTUÉ PAR.: Guido Bérubé, Tech.

APPROUVÉ PAR.: Annie Hélène Bellavance, ing.

GÉNIGROUPE

DESCRIPTION STRUCTURALE DU ROCHER

PAGE DE

FIRME: TPSGC	CONTRAT NO: 201511	FORAGE NO: F-1
PROJET: Institut Maurice Lamontagne	EMPLACEMENT: Sainte-Flavie	

PROFONDEUR (m) DE	A	STRUCTURE FAILLE, JOINT, LITAGE CLIVAGE, LINEATION SCHISTOSITE FOLIATION, ETC	NOMBRE DES JOINTS	ANGLE A L'AXE DE LA CAROTTE	FERME	OUVERT	COURBE	IRREGULIER	MIROIR DE FAILLE	RECOUVERT DE (X) ET EPAISSEUR	ALTERATION	COULEUR (XX)	COURSE DE	COURSE A	RDQ EN %	RECUPERATION DE CAROTTES EN %	PERTE D'EAU EN %
7'0''	10'0''	Grès à grain fin, gris	100	45								gr			0	RDQ	
0'0''	14'0''	Grès à grain fin, gris, un peu de calcaire dissout blanc	10	45								gr			50	RDQ	

X) C= CALCITE
G= GRAPHITE
I= OXYDE DE FER
K= CHLORITE
E= EPIDOTE
B= BIOTITE
R= ROUILLE
P= PYRITE
S= SALBANDE

(XX) bl= blanc
r = rosâtre
g = gris
v = verdâtre
j = jaunâtre
b = blanchâtre

DESIGNATION QUALITATIVE DU ROC (RQD)

$$RDQ\% = \frac{\text{TOTAL} > 0.1\ m}{\text{LONGUBUR DE LA COURSE}} \times 100$$

0 = 25% MAUVAIS
25 = 50% MEDIOCRE
50 = 75% MOYEN
75 = 90% BON
90 = 100% EXCELLENT

GÉNIGROUPE
GÉNIGROUPE INTERNATIONAL
GÉNILAB BSLG
GÉNILAB ENVIRONNEMENT
GÉNIVIT EXPERT
ISO 9002

RAPPORT DE FORAGE

DOSSIER No.: 201511
PROJET: Bâtiment des bassins et app. en eau
ENDROIT: IML, Sainte-Flavie

FORAGE No.: F-2
DATE DU FORAGE: 01-06-18
TECHNICIEN: Guido Bérubé, Tech.
MARTEAU: 63.5 CHUTE: 0.76 TUBAGE:

ÉCHANTILLONAGE ET ESSAIS AU CHANTIER | **ESSAIS EN LABORATOIRE**

TYPES D' ÉCHANTILLONNEURS

CF : CUILLIÈRE FENDUE STD
TS : TUBE SHELBY
PS : ÉCHANTILLONNEUR À PISTON
CD : CAROTTIER À DIAMANTS, CALIBRE
WS/AS : ÉCHANTILLON PAR LAVAGE / À LA TARIÈRE

ÉTAT DE L'ÉCHANTILLON:

REMANIÉ NON REMANIÉ PERDU CAROTTÉ

TYPES ET RÉSULTATS D' ESSAIS:

VT : SCISSOMÈTRE
PT : PÉNETROMÈTRE
PM : PRESSIOMÈTRE MENARD
N : INDICE DE PÉNÉTRATION STD. (COUPS / 0.3 M)
K : PERMÉABILITÉ
▼ : NIVEAU D'EAU SOUTERRAIN
CU/CUR : CISAILLEMENT SOL INTACT / SOL REMANIÉ
PL : PRESSION LIMITE (kPa)

AG : ANALYSE GRANULOMÉTRIQUE
ϑ : POIDS UNITAIRE HUMIDE (KN/m3)
U : COMPRESSION SIMPLE (Kpa)
Q : TRIAXIAL N.C. N.D. (kPa)
(%) : DÉFORMATION À LA RUPTURE
VL : SCISSOMÈTRE DE LABORATOIRE
C : CONSOLIDATION
⊢ LIMITE DE PLASTICITÉ (%)
O TENEUR EN EAU NATURELLE (%)
⊣ LIMITE DE LIQUIDITÉ (%)

Élév. (m)	PROF (m)	DESCRIPTION	Strat.	NIVEAU D'EAU	ÉCHANTILLONS TYPE ET No.	ÉTAT	REC. %	N	ESSAIS	COUPS / 0.3m 20 40 60 80 / RÉSISTANCE Cu (kPa) 20 40 60 80	LIMITES D'ATTERBERG (%) 20 40 60 80
8.83		surface du terrain									
8.76 / 0.07		Béton Bitumineux									
8.14 / 0.69		sable fin, un peu de gravier, traces de silt, brun.			CF-1		67	--- N=41	Refus		
	1	Roc, mudstone gris foncé, très poreux, qualité varie de très mauvaise à mauvaise									
	2				CR-2		100		RQD 0%		
	3				CR-2A		100		RQD 40%		
5.48 / 3.35		Arrêt du forage à 3,35 m de profondeur.									
	4										
	5										
	6										
	7										
	8										
	9										
	10										

EFFECTUÉ PAR.: Guido Bérubé, Tech.

APPROUVÉ PAR.: Annie Hélène Bellavance, ing.

GÉNIGROUPE

DESCRIPTION STRUCTURALE DU ROCHER

PAGE DE

FIRME: TPSGC	CONTRAT NO: 201511	FORAGE NO: F-2
PROJET: Institut Maurice Lamontagne	EMPLACEMENT: Sainte-Flavie	

PROFONDEUR (m) DE	A	STRUCTURE: FAILLE, JOINT, LITAGE, CLIVAGE, LINEATION, SCHISTOSITE, FOLIATION, ETC	NOMBRE DES JOINTS	ANGLE A L'AXE DE LA CAROTTE	FERME	OUVERT	COURBE	IRREGULIER	MIROIR DE FAILLE	RECOUVERT DE(X) ET EPAISSEUR	ALTERATION	COULEUR (XX)	COURSE DE	COURSE A	RDQ EN %	RECUPERATION DE CAROTTES EN %	PERTE D'EAU EN %
5'0''	8'0''	Mudstone gris foncé et très poreux	100	90°								gr			0	RDQ	
8'0''	11'0''	Mudstone gris foncé et très poreux	10	90°								gr			40	RDQ	

X) C= CALCITE
G= GRAPHITE
I= OXYDE DE FER
K= CHLORITE
E= EPIDOTE
B= BIOTITE
R= ROUILLE
P= PYRITE
S= SALBANDE

(XX) bl= blanc
r = rosâtre
g = gris
v = verdâtre
j = jaunâtre
b = blanchâtre

DESIGNATION QUALITATIVE DU ROC (RQD)

$$RDQ\% = \frac{\text{TOTAL} > 0.1\ m}{\text{LONGUEUR DE LA COURSE}} \times 100$$

0 = 25% MAUVAIS
25 = 50% MEDIOCRE
50 = 75% MOYEN
75 = 90% BON
90 = 100% EXCELLENT

GÉNIGROUPE
GÉNIGROUPE INTERNATIONAL
GÉNILAB BSLG
GÉNILAB ENVIRONNEMENT
GÉNIVIT EXPERT
ISO 9002

RAPPORT DE FORAGE

DOSSIER No.: 201511
PROJET: Bâtiment des bassins et app. en eau
ENDROIT: IML, Sainte-Flavie

FORAGE No.: F-3
DATE DU FORAGE: 01-06-18
TECHNICIEN: Guido Bérubé, Tech.
MARTEAU: 63.5 CHUTE: 0.76 TUBAGE:

ÉCHANTILLONAGE ET ESSAIS AU CHANTIER | **ESSAIS EN LABORATOIRE**

TYPES D' ÉCHANTILLONNEURS

CF : CUILLIÈRE FENDUE STD
TS : TUBE SHELBY
PS : ÉCHANTILLONNEUR À PISTON
CD : CAROTTIER À DIAMANTS, CALIBRE
WS/AS : ÉCHANTILLON PAR LAVAGE / À LA TARIÈRE

ÉTAT DE L'ÉCHANTILLON:

REMANIÉ NON REMANIÉ PERDU CAROTTÉ

TYPES ET RÉSULTATS D' ESSAIS:

VT : SCISSOMÈTRE
PT : PÉNETROMÈTRE
PM : PRESSIOMÈTRE MENARD
N : INDICE DE PÉNÉTRATION STD. (COUPS / 0.3 M)
K : PERMÉABILITÉ
▼ : NIVEAU D'EAU SOUTERRAIN
CU/CUR : CISAILLEMENT SOL INTACT / SOL REMANIÉ
PL : PRESSION LIMITE (kPa)

AG : ANALYSE GRANULOMÉTRIQUE
ϑ : POIDS UNITAIRE HUMIDE (KN/m3)
U : COMPRESSION SIMPLE (Kpa)
Q : TRIAXIAL N.C. N.D. (kPa)
(%) : DÉFORMATION À LA RUPTURE
VL : SCISSOMÈTRE DE LABORATOIRE
C : CONSOLIDATION
⊢ LIMITE DE PLASTICITÉ (%)
O TENEUR EN EAU NATURELLE (%)
⊣ LIMITE DE LIQUIDITÉ (%)

Élév. (m)	PROF (m)	DESCRIPTION	Strat.	NIVEAU D'EAU	ÉCHANTILLONS TYPE ET No.	ÉTAT	REC. %	N	ESSAIS	COUPS / 0.3m 20 40 60 80 / RÉSISTANCE Cu (kPa) 20 40 60 80	LIMITES D'ATTERBERG (%) 20 40 60 80
2.82		surface du terrain									
2.21		Roc, schiste argileux, altéré, friable, de très mauvaise qualité.			CR-1		100		RQD 0 %		
0.61	1	Roc, shiste argileux, noir			CR-2		92		RQD 50 %		
0.69	2										
2.13		Arrêt du forage à 2,13 m de profondeur									
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										

EFFECTUÉ PAR.: Guido Bérubé, Tech.

APPROUVÉ PAR.: Annie Hélène Bellavance, Ing

GÉNIGROUPE

DESCRIPTION STRUCTURALE DU ROCHER

PAGE DE

FIRME: TPSGC | CONTRAT NO: 201511 | FORAGE NO: F-3

PROJET: Institut Maurice Lamontagne | EMPLACEMENT: Sainte-Flavie

PROFONDEUR (m) DE	A	STRUCTURE: FAILLE, JOINT, LITAGE, CLIVAGE, LINEATION, SCHISTOSITE, FOLIATION, ETC	NOMBRE DES JOINTS	ANGLE A L'AXE DE LA CAROTTE	FERME	OUVERT	COURBE	IRREGULIER	MIROIR DE FAILLE	RECOUVERT DE (XX) ET EPAISSEUR	ALTERATION	COULEUR (XX)	COURSE DE	COURSE A	RDQ EN %	RECUPERATION DE CAROTTES EN %	PERTE D'EAU EN %
0''	5'0''	Schiste argileux noir	20	20								n			0	RDQ	
5'0''	7'0''	Schiste artileux noir	10	30								n			50	RDQ	

() C= CALCITE
G= GRAPHITE
I= OXYDE DE FER
K= CHLORITE
E= EPIDOTE
B= BIOTITE
R= ROUILLE
P= PYRITE
S= SALBANDE

(XX) bl= blanc
r = rosâtre
g = gris
v = verdâtre
j = jaunâtre
b = blanchâtre
n = noir

DESIGNATION QUALITATIVE DU ROC (RQD)

$$RDQ\% = \frac{\text{TOTAL} > 0.1\ m}{\text{LONGUEUR DE LA COURSE}} \times 100$$

0 = 25% MAUVAIS
25 = 50% MEDIOCRE
50 = 75% MOYEN
75 = 90% BON
90 = 100% EXCELLENT

ANNEXE III

Analyses de laboratoire

GÉNILAB BSLG INC.

Essai de compression sur carotte de béton de ciment

Norme CAN/CSA-A23.2-14C

Dossier N° 201511 Carotte N° F-3 3'

Client I.M.L.

Projet Bassin

Ouvrage carotté

Equipement utilisé Diamètre du carottier

Prélevé par M. Bérubé Date 18-06-01

Analysé par M. Foigle Date 05-07-01

Type de mûrissement Âge du béton

Type de coiffe Grosseur maximale agrégats

MESURE

Diamètre 1 47,47 mm Diamètre 2 47,49 mm Moyenne 47,48 mm

Longueur avec la coiffe 92,17 mm

Rapport longueur / diamètre moyen 1,92

Facteur de correction (F.c.) 0,9936 (voir tableau au verso)

ESSAI EN COMPRESSION

Lecture 9274 LBS ~~KN~~ 41,3 KN Superficie = $\frac{\pi D^2}{4}$ = $\frac{\pi \cdot 47,47}{4}$ = 2,75 ~~m²~~ mm² 1770,5 mm²

÷145

Lecture (kN) / Superficie (mm²) x 1000 = 9274 / 2,75 kN / mm² x 1000 = 23,3 MPa 23,3 MPa ✓ OK

Résistance corrigée = Résistance 23,3 MPa X F.c. 0,9936 = 23,2 MPa

Noter toute condition anormale de la carotte (acier d'armature, nid d'abeille, type de fracture).

☑ Facturé

☑ Compilé

05-07-01 Date

M.F. Technicien

GLAL-02 Rev.00

Directeur de laboratoire Date

GÉNILAB BSLG INC.

Essai de compression sur carotte de béton de ciment

Norme CAN/CSA-A23.2-14C

Dossier N° 201511 Carotte N° F-2 8"

Client T.M.L.

Projet Bassin

Ouvrage carotté

Equipement utilisé Diamètre du carottier

Prélevé par M. Beaule Date 18-06-01

Analysé par M. Gaigle Date 05-07-01

Type de mûrissement Âge du béton

Type de coiffe Grosseur maximale agrégats

MESURE

Diamètre 1 47,47 mm Diamètre 2 47,55 mm Moyenne 47,51 mm

Longueur avec la coiffe 72,18 mm

Rapport longueur / diamètre moyen 1,52

Facteur de correction (F.c.) 0,9616 (voir tableau au verso)

ESSAI EN COMPRESSION

Lecture 11454 LBS ~~kN~~ 50,9 kN Superficie = $\frac{\pi D^2}{4} = \frac{\pi \cdot 1.87^2}{4} = 1,47$ po ~~mm²~~ 1772.8 mm²

÷145

Lecture (kN) x 1000 = 11454 kN x 1000 = 28,7 MPa 28,7 MPa ✓ dc
Superficie (mm²) 2,75 mm²

Résistance corrigée = Résistance 28,7 MPa X F.c. 0,9616 = 27,6 MPa

Noter toute condition anormale de la carotte (acier d'armature, nid d'abeille, type de fracture).

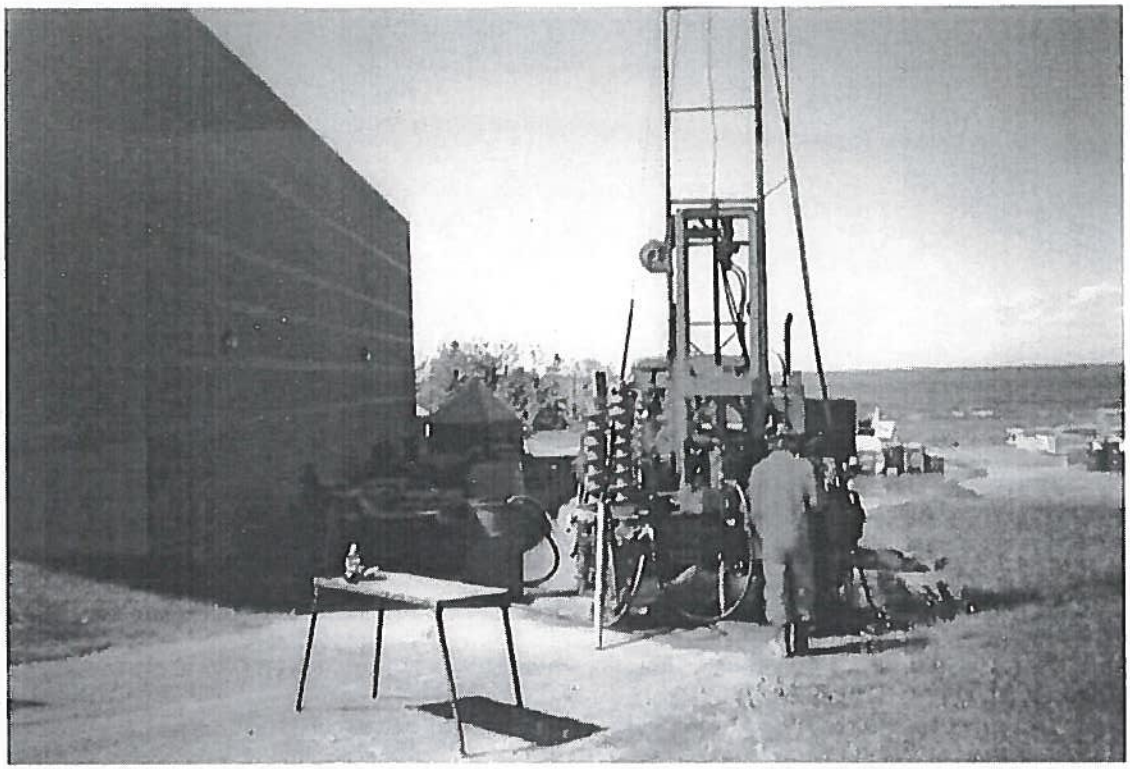
☑ Facturé
☑ Compilé
05-07-01
Date
M.G.
Technicien

GLAL-02 Rev.00

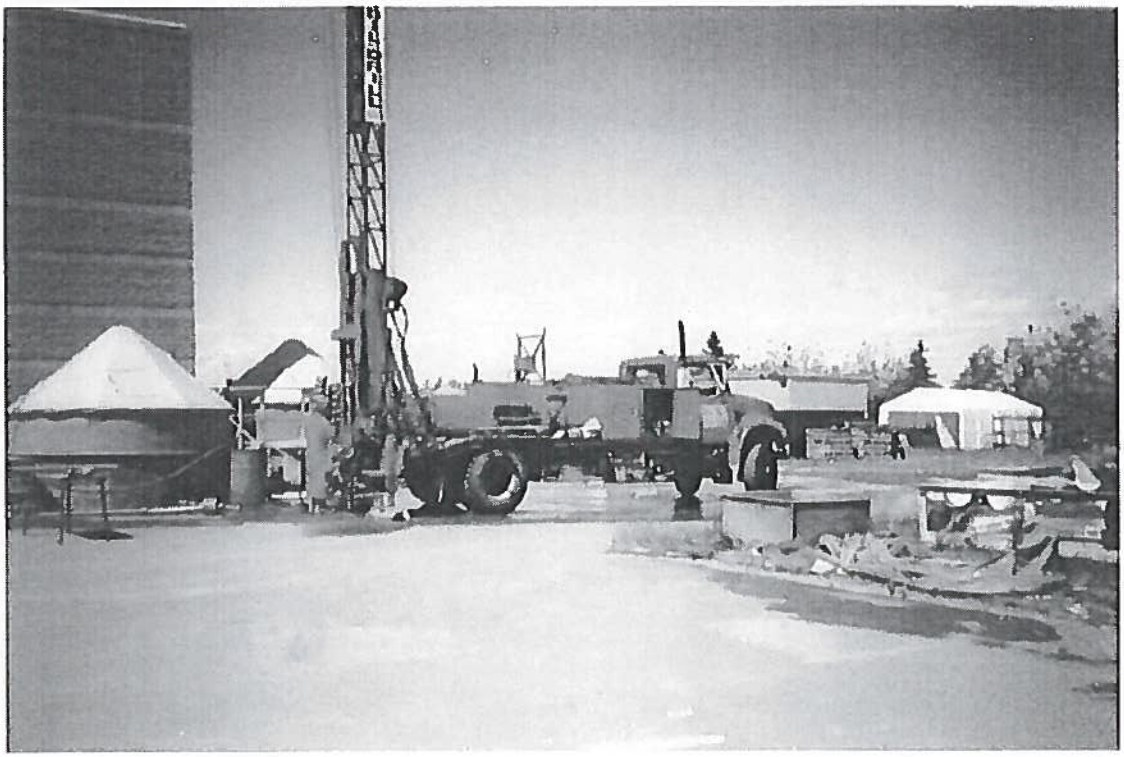
Directeur de laboratoire Date

ANNEXE IV

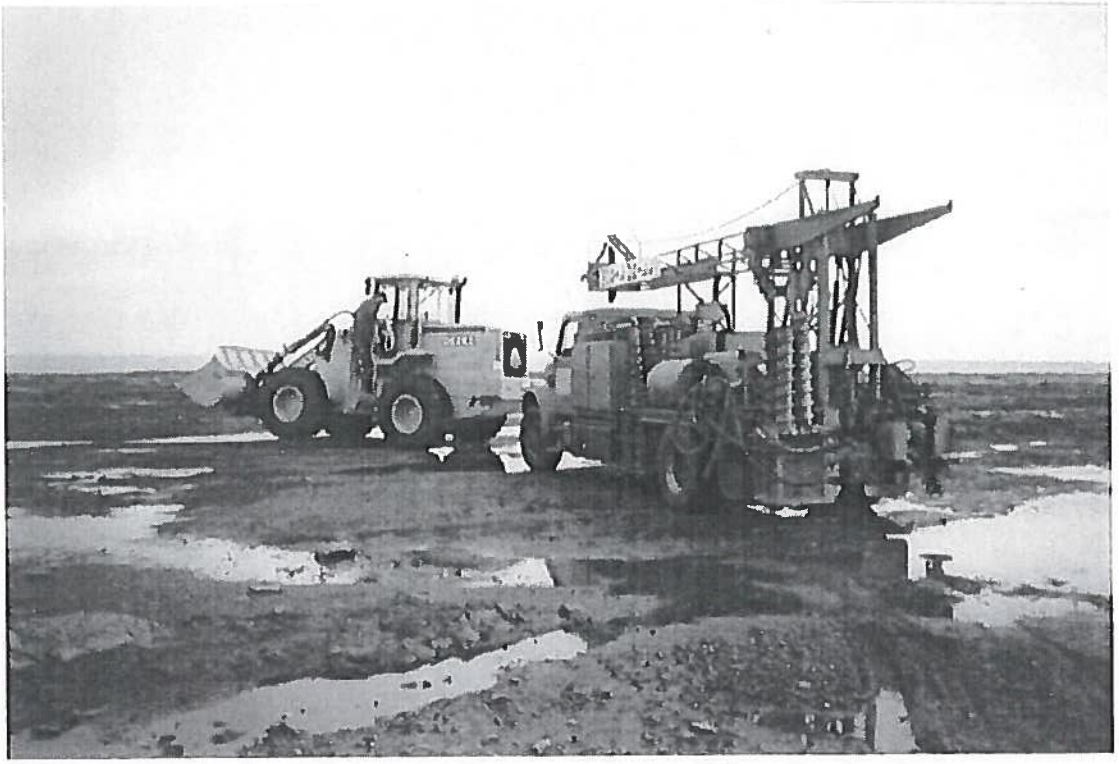
Photographies



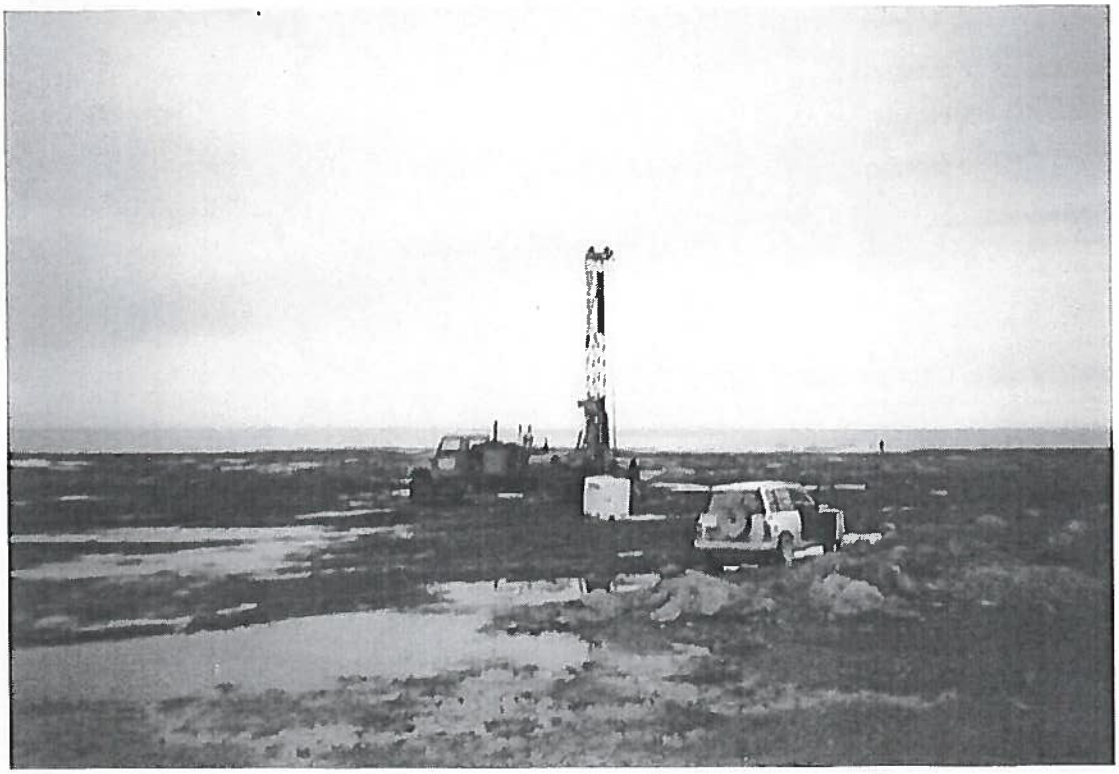
1. Vue du forage no 1 regardant vers le nord



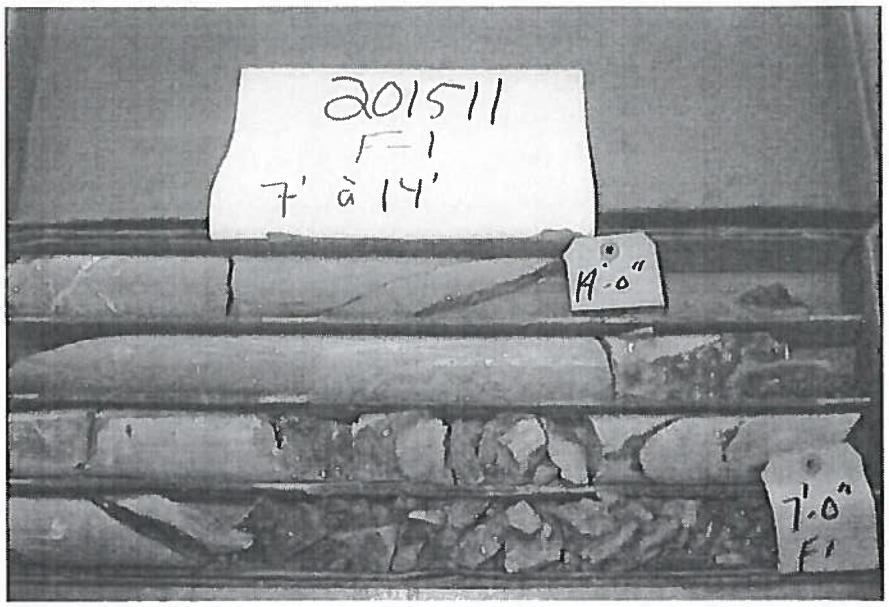
2. Vue du forage no 2 regardant vers l'ouest

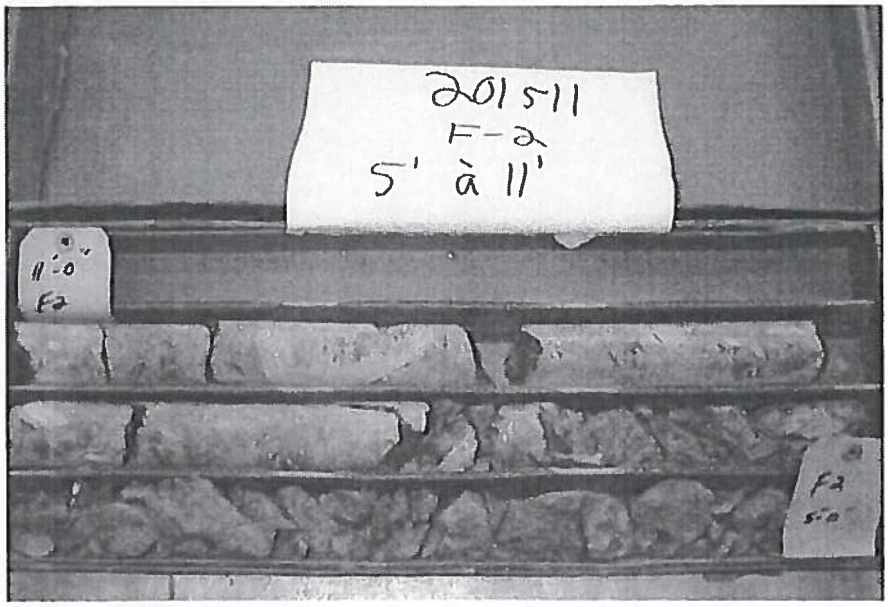


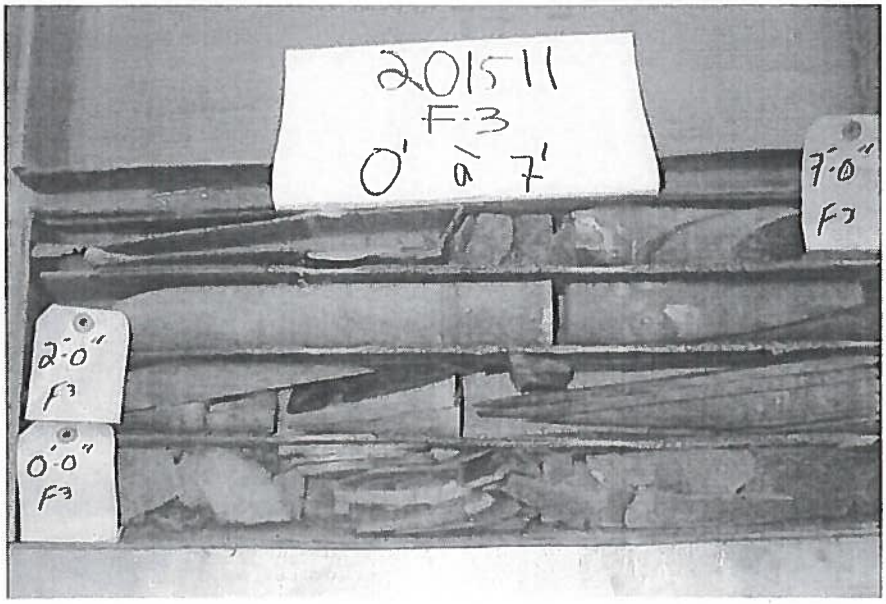
3. Vue de l'emplacement du forage F-3 regardant vers le nord



4. Vue du forage F-3 regardant vers le nord


201511
F-1
7' à 14'
14'-0"
7'-0"
F1


201511
F-2
5' à 11'
11'-0"
F2
F2
5'-0"


201511
F-3
0' à 7'
7'-0"
F3
2'-0"
F3
0'-0"
F3