



# **PARKS CANADA**

## **North Entrance Rehabilitation Fort Lennox**

Civil and Structural Engineering

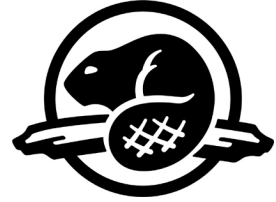
### **Technical Specification**

July 2015  
Ref. n°: 159000009-0-00-300-PO-102-00



Parcs  
Canada

Parks  
Canada



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Civil and structural Engineering

### **Technical Specification**

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**Partie 1      General**

**1.1            RELATED REQUIREMENTS**

- .1      All drawings issued for tender

**1.2            SUMMARY OF WORKS**

- .1      The Contractor must respect all archaeological monitoring clauses indicated in point 1.3.

**1.3            ARCHAEOLOGICAL CLAUSES**

- .1      Special Conditions:
  - .1      The Canadian National Historic Site of Fort Lennox was recognized by the Canadian government as one of the sites with the highest heritage value. Therefore, all excavation work recognized as potentially containing historical remains or ruins should be monitored by an Archaeologist appointed by Parks Canada Agency.
  - .2      Due to the high potential to retrieve archaeological information during excavation works required for the rehabilitation of Northern gateway of Fort Lennox, Those works are therefore subject to this section of the specifications.
- .2      Access and Collaboration:
  - .1      The Contractor must cooperate and comply with all instructions given by the architect or the project manager during excavation works to avoid any loss of archaeological information on the site.
  - .2      The Contractor must facilitate access to the work site and collaborate with the Archaeologist. The Archaeologist or his representative will be based on site as required related to the protection and recording of the historical remains. Their role will be to guide the Contractor to avoid loss of archaeological information and to gather information on the remains.
  - .3      The Contractor must allow the team of archaeologists to conduct examinations and archaeological surveys.
- .3      Archaeological Discoveries
  - .1      The Contractor must notify the Consultant or, in his absence, the Archaeologist or his representative of any archaeological discovery (remains of buildings or facilities, objects, and fragments of objects) made on the premises and wait for his written instructions before continuing work in the area of the discovery.
  - .2      Relics, antiques, and other items with some interest from a historical, archaeological, or scientific point of view (remains, object, or fragment of an object) found on the site or in the areas of excavation or demolition remain the property of the Crown. The Contractor must protect and obtain instructions from the Project Manager in this regard.
- .4      Suspension of Work:

- .1 The Contractor must provide in his contract, at his expense, the suspension of work for thirty (30) minutes per half-day of excavation in all areas requiring the presence of the Archaeologist (as described in section 1.3.1 this section). These work stoppages, if not used, will be accumulated and can be reused later as needed. A list of the unused time will be recorded by the Consultant in agreement with the Contractor and the Archaeologist.
- .2 For work stoppages lasting more than 30 minutes, the Departmental representative will assess the implications of the stoppage and notify the Contractor to that effect. The Contractor may be required to move the machinery to another area to allow the continuation of the archaeologists' work. If reassignment is not possible, the Contractor will be compensated from the bank of hours or if it is used up, according to the agreements made at the first site meeting.
- .5 Manual Excavations for Archaeological Purposes:
  - .1 Given the possibility of archaeological discoveries, the Contractor is advised that during work, manual excavation may be required as well as any work necessary to ensure the protection of discoveries. The Contractor shall be compensated according to the agreements made at the first site meeting.
- .6 Protection of Relics and Structures:
  - .1 The Contractor must take all reasonable precautions during excavation and other works to protect the excavated remains and to allow their examination by the Archaeologists. Parks Canada Agency will not tolerate any exception in this regard. If by neglect the Contractor deteriorates any relic whatsoever, he will be held responsible and the Department will determine the implications.
  - .2 In the event where the Consultant authorizes the demolition of materials on site, the Contractor must take all necessary precautions to ensure protection of the adjacent structures that are not to be demolished. The demolition of materials must be carried out gradually and in a controlled manner after the archaeological surveys have been completed. If items are damaged during construction works, immediately notify the Project Manager
  - .3 After surveys realised by the Archaeologists, the Contractor shall laydown on relics a geotextile and cover them with clean filling material. These protection works will be done under supervision by Archaeologists.

**END OF SECTION**

## **Part 1           General**

### **1.1               WORK COVERED BY CONTRACT DOCUMENTS**

.1       The Work covered by this contract includes the restoration of the Fort Lennox Northern gateway and the retaining walls along the pedestrian crossing to the inner courtyard, part of the Fort Lennox National historic Site, located on Île aux Noix, Saint-Paul-de-l'Île-aux-Noix. The Work comprise, without being limited to:

- .1       Water blasting of visible surface of retaining walls and arch;
- .2       Foundation repair at bottom of arch;
- .3       Waterproofing of retaining walls and casemate nos2 and 3;
- .4       Repointing and grouting of visible surface of retaining walls and arch.
- .5       Drilling and grouting from the bottom of arch's roof;
- .6       New roof above arch;
- .7       Replacement of damage stone;
- .8       Replacement of two wood entry doors;
- .9       Electricity – Replacement/Displacement of pull boxes;

As indicated on specifications and drawings.

### **1.2               WORK SCHEDULE**

- .1       All works shall be performed in full not later than November 13<sup>th</sup>, 2015.
- .2       The contractor shall bear the cost of temporary protection and heating of the structures as required to meet the contractual delivery due dates.

### **1.3               NATIONAL PARKS ACT**

- .1       Construct Works to be performed within any National Historic Sites, National historic Parks, National parks or National historic canal in accordance with current provisions of the National Parks Act.

### **1.4               CONTRACTOR USE OF PREMISES**

- .1       Limit use of premises for Work, for storage and for access, to allow Public usage.
- .2       Co-ordinate use of premises under direction of Site Supervisor.

### **1.5               EXISTING SERVICES**

- .1       Notify, Site Supervisor and utility companies of intended interruption of services and obtain required permission.
- .2       Establish location and extent of service lines in area of work before starting Work. Notify Site Supervisor of findings.

**1.6 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
- .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as specified.

**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                ACCESS AND EGRESS**

- .1        Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders [and scaffolding], independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

**1.2                USE OF SITE AND FACILITIES**

- .1        Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Site Supervisor to facilitate work as stated.
- .2        Maintain existing services to building and provide for personnel and vehicle access.
- .3        Where security is reduced by work provide temporary means to maintain security.
- .4        Closures: protect work temporarily until permanent enclosures are completed.

**1.3                USE OF SITE BY PARKS CANADA AGENCY**

- .1        Le Parc historique national Fort Lennox est ouvert aux visiteurs :
  - .1        From June 15<sup>th</sup> to September 7<sup>th</sup> 2015 : every days, from 10 h to 18 h.
  - .2        From September 11<sup>th</sup> to October 12<sup>th</sup> 2015, every Friday, Saturday, Sunday and holydays, from 10 h to 17 h.
  - .3        After October 13<sup>th</sup> : The site will be closed to the public
- .2        Special events :
  - .1        Friends or Fort Lennox Benefit dinner: Samedi le 22 août 2015.

**1.4                ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1        Execute work with least possible interference or disturbance to normal use of premises. Arrange with Site Supervisor to facilitate execution of work.

**1.5                SPECIAL REQUIREMENTS**

- .1        Transportation services to Île-aux-Noix
  - .1        Parks Canada
    - .1        Parks Canada will use this type of watercraft for maritime transportation: Barge (19,72 m x 6,25 m), maximum working load of 54 tonnes (dependent of wind and water variation).
    - .2        Travels must be planned in advance. A minimum schedule need to be provide to the boat's captain, once a week, one week ahead of time. At least 24 hours notice, modifications may be accepted or decline by the boat's captain. The appointments must be planned at fixed hours to avoid unnecessary waste of time.



- .3 Barge transport will be available from 7h45 to 15h20, from Monday to Friday, except holidays. A maximum amount of 6 roundtrips will be allowed per day.
- .4 Maritime transport will always be conditional to the weather conditions and tide levels. Parks Canada cannot guarantee transport services at all times.
- .5 Parks Canada may, at its sole discretion, refuse to carry certain goods if the goods in question present a real danger for Parks Canada's employee or for the barge and traveler's security. The boat's captain will ensure that the load weight does not exceed the maximum load capacity of the barge and the orientations issued by Parks Canada should be respected.
- .6 Barge transportation will be ensured by Parks Canada until Octobre 23<sup>th</sup> 2015.
- .2 Contractor's responsibilities:
  - .1 Contractor is responsible to load and unload material, wastes and other items transported with Parks Canada's boats.
  - .2 Contractor is responsible to provide a boat for the transportation of his employees. A dock location will be made available.
  - .3 Contractor is responsible to provide a barge for transporting his equipments beyond October 23<sup>th</sup> 2015. A dock location will be made available only after October 23<sup>th</sup> 2015.
  - .4 All passengers should comply with the captain's orders and Transport Canada's obligations or be denied boarding.
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

## **1.6 SECURITY**

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
  - .1 Obtain requisite clearance, as instructed, for each individual required to enter premises.

## **1.7 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions. Smoking is not permitted.

## **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                NOT USED**

.1            Sans objet

**Part 2            Explanation of the Bid Form prices**

**2.1                Item 1. – Site layout, Environment, and General Items**

.1            Site layout – Item 1.1

- .1            The price for item 1.1 of the bid form is a global lump sum amount which covers all of the preparations and installations required to perform the work and not included in other items for payment in the tender document.
- .2            Price includes but is not limited to the cost of the following:
  - .1            All elements described in section 01 52 00 “Construction facilities”, such as site office, access roads, sanitary installations, electrical power and lighting at the site, furniture, phone and related services (pagers, photocopiers, etc.), heating and ventilation of the site office and storage building, scaffolding, site billboards and maintenance.
  - .2            All items described in section 01 33 00 “Submittal procedures”.
  - .3            All items described in section 01 35 29.06 “Health and safety requirements”.
  - .4            All items described in section 01 56 00 “Temporary barriers and enclosures”.
  - .5            All items described in section 01 74 11 “Cleaning”.
  - .6            All items described in section 01 74 21 “Construction/Demolition waste management and disposal”.
  - .7            Maintenance of the site and access roads as well as clearing of snow and ice from the site.
  - .8            All items required in the following sections and not directly or indirectly covered in one of the items of the bid form:
    - .1            Item 01 45 00 “Quality control”
    - .2            Item 01 77 00 “Closeout procedures”
    - .3            Item 01 78 00 “Closeout submittals”
  - .9            Costs of surveying and staking the works and investigation costs not covered in any other item of the price list.
  - .10           Costs of site security (if required).
  - .11           The protection of existing utilities on the site work. If contractor damage these installations during his work, he must replace them at his own expense.

- .3 A portion equal to 25 % of the total amount given for this item will be paid out with the first progress report on the condition that work has begun.
- .4 Other amounts for this item will be paid out with each progress report in proportion with the general progress of the work for that report.
- .5 A portion equal to 25% with the payment at issuance of the “Certificate of substantial (provisional) completion”.
- .6 The following are excluded from this item:
  - .1 Environmental protection measures (covered in item 1.2);
  - .2 Arrangement of temporary access (covered in item 1.3).
  
- .2 Environmental protection measures –Item 1.2
  - .1 The price for item 1.2 of the bid form is a fixed lump sum amount to compensate all necessary expenses incurred for measures to protect the environment in accordance with the requirements of the specifications.
  - .2 The amount includes, but is not limited to, the following:
    - .1 All that is described in Section 01 35 43, “*Environmental Procedures*” such as the preparation, presentation, and implementation of the environmental protection plan.
    - .2 The preparation, presentation, and implementation of:
      - .1 the emergency spill plan;
      - .2 the construction facilities location plan;
      - .3 the work zone plans;
      - .4 the air pollution prevention plan;
      - .5 the contamination prevention plan;
      - .6 the wastewater management plan;
      - .7 the plan for the designation and protection of wetlands and historical, archaeological, cultural, and biological resources;
      - .8 a plan to protect the historical and heritage character of the site.
    - .3 Plant protection measures.
    - .4 Temporary facilities for pollution prevention
    - .5 All that is described in the annex 1 of the section 01 35 43 “*Environmental Procedures*”
  - .3 A portion equal to 20 % of the total amount bid for this item will be paid with the first progress claim, provided that the work is begun.
  - .4 Other progress payments under this item will be paid to a percentage consistent with the general progress of work for each progress claim period.
  
- .3 Arrangement of temporary access–Item 1.3
  - .1 The price for item 1.3 of the bid form is a fixed lump sum amount that includes the supply of materials, mobilization of labor, tools, and equipment required to

- carry out the work for arrangement of temporary access as prescribed by section 01 56 00 "Temporary barriers and enclosures".
- .2 The following is excluded from this item:
    - .1 Work organization for excavation and cofferdam (covered in item 1.5);
  
  - .4 Removal of exiting installations during work –Item 1.4
    - .1 The price for item 1.4 of the bid form is a fixed lump sum amount that includes the removal of existing installations, including the permanently suspended door and the platform installed between walls.
    - .2 The amount includes the removal of the permanently suspended door without damage, storage and reinstalling. A procedure must be submitted for Site Supervisor's approval.
    - .3 The amount also includes the removal of the existing platform between walls to hand over to Parks Canada, as directed by Site Supervisor.
  
  - .5 Work organization for excavation and cofferdam –Item 1.5
    - .1 The price for item 1.5 of the bid form is a fixed lump sum amount that includes the supply of measures and necessary installations to carry out excavation works (item 2.2) and cofferdam works (item 2.1).
    - .2 The amount includes, but is not limited to, the following:
      - .1 Transportation of required equipment to carry out the work in the Fort's side;
      - .2 The protection of bridge's wood decking in front of the north gate, if required;
      - .3 Supply, transport, assembly, disassembly of portable barge, if required;
      - .4 The required temporary facilities to carry out the installation of equipment in the Fort's side (and retrieve it);
      - .5 Equipment for the mobilization and demobilization of labor;
      - .6 All required amount to carry out the work that are excluded of the amounts for "excavation" (covered in item 2.2) and "cofferdam (covered in item 2.1).

## **2.2 Item 2 – Arch's Foundation**

- .1 Cofferdam - Item 2.1
  - .1 The price for item 2.1 of the bid form is a fixed lump sum amount that includes required cofferdam installing and dismantling, in order to carry out the works of arch foundation repair in a dry area. The water level in the working area must be approx. 300 mm below the level of work required in the plan.

- .2 The amount includes all requirements of the specifications as prescribed by section 31 23 33.01 "Excavating, trenching and backfilling", about cofferdam and dewatering, and more specifically, but is not limited to, the following:
  - .1 Geodesic survey of the site before construction;
  - .2 Design and shop drawings;
  - .3 Design and construction of dewatering system;
  - .4 Work method statement, including equipment's transportation to the site work;
  - .5 Construction and removal;
  - .6 Maintenance of cofferdam and dewatering during the works.
  - .7 Disposal of materials off site, including removal offsite of cofferdam materials which came into contact with sediments at the bottom of the moat;
  - .8 Geodesic survey after removal;
  - .9 Supply and installation of equipment for dewatering system, including generators, pumps, pipes, fittings and all the accessories;
  - .10 Operation (even in cold weather), including fuel, maintenance and repair of dewatering systems;
  - .11 Treatment of pumped water;
  - .12 Installation and removal of filtering screens around the cofferdam;
  - .13 Transfer of trapped fish at the beginning of the dewatering process.
  - .14 Installation and removal of dewatering systems.
  - .15 Supply all necessary equipment and labor for the dewatering works.
- .3 For payment purposes, 70 % of the global lump sum price for the construction of the cofferdam will be paid out immediately following its successful installation which is to provide an adequately dried out condition.
- .4 Removal of the cofferdam will be paid according to 30 % of the global lump sum amount in the progressive payment following its removal.
- .5 The following is excluded from this item:
  - .1 Environmental protection measures (covered in item 1.2);
- .2 Excavation 2nd class (backfilling included) – Item 2.2
  - .1 The price for item 2.2 of the bid form is a fixed lump sum amount that includes all the work involved with excavation as shown on the drawings, cross sections, elevations and details; lawn removal, stripping of top soil and hard surfaces, dewatering and drainage of excavation bottoms, cleaning of the bottom of casemates before application of a mortar or lean concrete, as well as backfilling with specified materials. This item also includes the stockpiling of materials for environmental characterisation, and the removal and disposal off site of non-contaminated materials in excess, and any incidental expense. Costs related to

- preservation of the historic and archaeological character of the site specified in Section 01 11 00 “Summary of Work” are also included in this item.
- .2 The amount includes, but is not limited to, the following:
    - .1 Transportation of borrow material to construction site (if required);
    - .2 The purchase and installation of borrow material according to drawings and as directed by Site Supervisor;
    - .3 Soil compaction as prescribed by section 31 23 33.01 “Excavating, trenching and backfilling”
    - .4 Clean up;
    - .5 Any incidental expense.
  
  - .3 Formwork – Item 2.3
    - .1 The price for item 2.3 of the Bid Form is a price per square meter (m<sup>2</sup>) of formwork required to concrete added thickness repair of the arch’s foundation, in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
    - .2 The amount includes, but is not limited to, the following:
      - .1 The supply, installation, and dismantling of required formwork;
      - .2 Supply and installation of formwork ties;
      - .3 Supply and application of repair mortar at formwork tie locations;
      - .4 Following the completion of the works, off-site disposal of the formwork materials;
      - .5 Any incidental expenses.
  
  - .4 Anti-leaching concrete for repair of arch’s foundation– Item 2.4
    - .1 The price for item 2.4 of the Bid Form is a price per cubic meter (m<sup>3</sup>) of anti-leaching concrete or type XV required to concrete added thickness repair of the arch’s foundation, in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
    - .2 The amount includes, but is not limited to, the following:
      - .1 Substrate treatment before pouring;
      - .2 Supply, installation, vibration, finishing, and wet curing of concrete;
      - .3 Cleaning concrete surfaces adjacent to the pouring area, including 100 mm minimum removal of joint’s mortar;
      - .4 Removal of damaged stones and adjacent stone support (these stones will not be replaced, the concrete will fill cavities);
      - .5 The working method and sketches for the lost supports (casted in concrete) of adjacent stones those withdrawn, all signed-sealed by an engineer;

- .6 Following the completion of the works, off-site disposal of all materials used during the correction of faulty repairs;
  - .7 Treatment of surplus materials in accordance with the requirements of Section 01 74 21 "Construction / Demolition Waste Management and Disposal";
  - .8 Any incidental expenses.
- .5 Galvanized wire mesh for repair – Item 2.5
- .1 The price for item 2.5 of the Bid Form is a unit price per kilogram of reinforcing galvanized wire mesh, in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The preparation, presentation, and correction, if required, of the Work Plan for the installation of reinforcing galvanized wire mesh;
    - .2 The mobilization of labour, tools, and equipment required to carry out the work;
    - .3 The preparation, presentation, and correction, if required, of the reinforcement shop drawings and bill of materials;
    - .4 The supply and shaping of reinforcing galvanized wire mesh;
    - .5 Any incidental expenses.
- .6 Galvanized reinforcement bars for concrete repair of arch's foundation – Item 2.6
- .1 The price for item 2.6 of the Bid Form is a unit price per kilogram of reinforcing galvanized reinforcement bars, in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The preparation, presentation, and correction, if required, of the Work Plan for the installation of reinforcing galvanized bars;
    - .2 The mobilization of labour, tools, and equipment required to carry out the work;
    - .3 The preparation, presentation, and correction, if required, of the reinforcement shop drawings and bill of materials;
    - .4 The supply and shaping of reinforcing galvanized reinforcement bars;
    - .5 Installation of required steel reinforcement;
    - .6 Any incidental expenses.
- .7 Chemical anchors for reinforcement bars– Item 2.7
- .1 The price for item 2.7 of the Bid Form is a unit price per chemical anchor, in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.



- .2 The amount includes, but is not limited to, the following:
  - .1 The preparation, presentation, and correction, if required, of the chemical anchor shop drawings and technical data sheets;
  - .2 The mobilization of labour, tools, and equipment required to carry out the work;
  - .3 Drilling and cleaning holes for the installation of chemical anchors;
  - .4 Supply, handling, transportation, and installation of chemical anchors;
  - .5 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 "Construction / Demolition Waste Management and Disposal";
  - .6 Any incidental expenses.
  
- .8 New masonry blocks of limestone – Item 2.8
  - .1 The price for item 2.8 of the Bid Form is a fixed lump sum amount that includes setting in place the new masonry blocs of limestone (cut stones without mortar joints) to the finishing of the visible part of reinforced concrete added thickness of arch's foundation, in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The mobilization of labour, tools, and equipment required to carry out the work;
    - .2 Supply, transportation, and installation of new masonry blocks including structural epoxy adhesive type Sikadur-31CF;
    - .3 Cleaning near to stones to be replaced;
    - .4 A mortar joint (if required) between irregular surface of actual wall of the arch and the end (inclined part) of new masonry cut stones.
    - .5 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 "Construction / Demolition Waste Management and Disposal";
    - .6 Transportation, handling, storage, supply and setting up of new masonry blocks of limestone
    - .7 Any incidental expenses.

### **2.3 Item 3 – Masonry repair**

- .1 Water blasting cleaning of stones – Item 3.1
  - .1 The price for item 3.1 of the Bid Form is a price per square meter (m<sup>2</sup>) that includes all requirements of the specifications as prescribed by section 04 03 06 "Historic Cleaning Masonry".
  - .2 The amount includes, but is not limited to, the following:

- .1 The mobilization of labour, tools, and equipment required to carry out the work;
  - .2 Supply of cleaning products, supply and installation of protection devices, the carry out cleaning and any incidental expenses.
- .2 Replacement of masonry blocks of limestone – Item 3.2
- .1 The price for item 3.2 of the Bid Form is a price per square meter (m<sup>2</sup>) that includes all requirements of the specifications as prescribed by section 04 03 42 “Historic Replacing Stone”.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The mobilization of labour, tools, and equipment required to carry out the work;
    - .2 Removal of deteriorated stones and those beyond specified in the drawings, which will be identified on site by the Site Supervisor;
    - .3 Measurement of stones to be replaced;
    - .4 The working method and sketches for the temporary supports of adjacent stones those withdrawn, all signed-sealed by an engineer;
    - .5 Supply, transportation, and installation of new masonry blocks of limestone and mortar, including anchors (if required), repointing all around stones that have been replaced and any incidental expense.
  - .3 The following are excluded from this item:
    - .1 Replacement of coping blocks of limestone walls (covered in item 3.3);
    - .2 New masonry blocks of limestone (covered in item 2.8).
- .3 Replacement of coping blocks of limestone walls – Item 3.3
- .1 The price for item 3.3 of the Bid Form is a price per linear meter (m) that includes all requirements of the specifications as prescribed by section 04 03 42 “Historic Replacing Stone”.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The mobilization of labour, tools, and equipment required to carry out the work;
    - .2 Removal of deteriorated stones and those beyond specified in the drawings, which will be identified on site by the Site Supervisor;
    - .3 Retrieve anchors or its replacement if required;
    - .4 Measurement of coping blocks to be replaced;
    - .5 Supply, transportation, and installation of coping blocks of limestone and mortar, including anchors (if required), repointing all around the stones that have been replaced and any incidental expense.

- .4 Repointing – Item 3.4
  - .1 The price for item 3.4 of the Bid Form is a price per linear meter (m) of repointing that includes all requirements of the specifications as prescribed by section 04 03 07 “Historic Masonry Repointing”.
  - .2 The amount includes, but is not limited to, the following:
    - .1 Preparation, presentation, and correction, if required, of masonry joints shop drawings and technical data sheets;
    - .2 The mobilization of labour, tools, equipment and products needed to carry out the work in accordance with the requirements of the specifications as described by section 04 03 08 “Historic Mortaring”;
    - .3 The cleaning of existing joints before the addition of new joints;
    - .4 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 *Construction / Demolition Waste Management and Disposal*;
    - .5 The installation and removal of sealing products and testing;
    - .6 Any incidental expenses.
  
- .5 Drilling for grouting from arch’s roof – Item 3.5
  - .1 The price for item 3.5 of the Bid Form is a unit price per drilled vertical hole from the bottom of arch’s roof inside masonry walls, in accordance with the requirements of the specifications as described by section 04 03 07 “Historic Grouting”.
  - .2 The amount includes drilling and cleaning holes as well as cleaning during work and cleaning following the completion of the works.
  - .3 The following is excluded from this item:
    - .1 Grout injection for the arch (covered in item 3.6)
  
- .6 Grout injection for the arch – Item 3.6
  - .1 The price for item 3.6 of the Bid Form is a price per cubic meter (m<sup>3</sup>) of grout injection inside drilled holes in masonry walls that have been done from the bottom of arch’s roof, in accordance with the requirements of the specifications as described by section 04 03 09 “Historic Grouting”.
  - .2 The amount includes, but is not limited to, the following:
    - .1 Preparation, presentation, and correction, if required, of masonry joints shop drawings and technical data sheets;
    - .2 The mobilization of labour, tools, equipment and products needed to carry out the work;
    - .3 The working method for pressure controlling of grout injection and a sequence explanation;
    - .4 The installation of blowhole pipes on the wall surfaces to control and verify grout spread inside the arch;

- .5 The correction of deteriorated mortars joints during grout injection works;
- .6 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 *Construction / Demolition Waste Management and Disposal*;
- .7 Any incidental expenses.
- .3 The following are excluded from this item:
  - .1 Drilling for grouting from arch's roof (covered in item 3.5);
  - .2 Grout injection walls after repointing (covered in item 3.7);
- .7 Grout injection after repointing – Item 3.7
  - .1 The price for item 3.7 of the Bid Form is a price per cubic meter (m<sup>3</sup>) of grout injection in walls in accordance with drawings and all requirements of the specifications as prescribed by section 04 03 09 “Historic Grouting”.
  - .2 The amount includes, but is not limited to, the following:
    - .1 Preparation, presentation, and correction, if required, of masonry joints shop drawings and technical data sheets;
    - .2 The mobilization of labour, tools, equipment and products needed to carry out the work;
    - .3 The working method for grout injection behind wall blocks of limestone, grouting sequence explanation, pumping to be used and blowhole pipes distribution;
    - .4 The installation of blowhole pipes on the wall surfaces and the correction of deteriorated mortars joints during grout injection works;
    - .5 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 *Construction / Demolition Waste Management and Disposal*;
    - .6 Any incidental expenses.
  - .3 The following are excluded from this item:
    - .1 Drilling for grouting from arch's roof (covered in item 3.5);
    - .2 Grout injection for the arch (covered in item 3.6);

## 2.4 Item 4 – Arch's roof

- .1 New roof installation – Item 4.1
  - .1 The price for item 4.1 of the Bid Form is a fixed lump sum amount that includes setting in place the new arch's roof, in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 Preparation, presentation, and correction, if required, of shop drawings and technical data sheets;

- .2 Supply and installation of wood structure, sheet metal coating, membrane, gutter and downspout;
- .3 The mobilization of labour, tools, equipment and products needed to carry out the work;
- .4 Any incidental expenses.

## **2.5 Item 5 – Drainage works behind walls**

- .1 Removal of vegetation – Item 5.1
  - .1 The price for item 5.1 of the Bid Form is a price per square meter (m<sup>2</sup>) required for all costs to remove vegetation within dimensions, in accordance with the requirements of the specifications and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The preparation, presentation, and correction, if required, of the Work Plan;
    - .2 The mobilization of labour, tools, and equipment required to carry out the work;
    - .3 Supply, transportation, handling, maintenance and required access removal for vegetation removal;
    - .4 Deforestation of surfaces identified by Site Supervisor
    - .5 Waste disposal disposition;
    - .6 Site cleanup at completion of work;
    - .7 Any incidental expenses.
- .2 Removal of existing membranes and existing drainage system – Item 5.2
  - .1 The price for item 5.2 of the Bid Form is a fixed lump sum amount for all costs to remove existing drainage system, existing clean stone and existing geotextile.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The preparation, presentation, and correction, if required, of the Work Plan;
    - .2 The mobilization of labour, tools, and equipment required to carry out the work;
    - .3 Supply, transportation and maintenance required for remove existing membranes, geotextile and drainage system;
    - .4 Topographical survey required for establish levels and piping outlet according to acceptable drainage slopes;
    - .5 A complete land survey of the bottom of casemates and walls after excavation and a photographic report showing the bottom of casemates and edges of exposed walls by spoil earth all along casemates. The lot must be handed over to Site Supervisor.

- .6 Waste disposal disposition;
  - .7 Site cleanup at completion of work; Any incidental expenses.
- .3 Surface preparation for mortar installation – Item 5.3
- .1 The price for item 5.3 of the Bid Form is a price per square meter (m<sup>2</sup>) required to prepare the surface before mortar installation in accordance with the requirements of the specifications and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 Water blasting to clean the surface in order to prepare new mortar installation. The surface should be clean and free of any loose material, deteriorated concrete, dust, dirt and anything that could affect adherence;
    - .2 The surface preparation to get it moist and with no standing water;
    - .3 The mobilization of labour, tools, and equipment required to carry out the work;
    - .4 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 *Construction / Demolition Waste Management and Disposal*;
    - .5 Any incidental expenses.
  - .4 Mortar for surface regularization – Item 5.4
    - .1 The price for item 5.4 of the Bid Form is a price per cubic meter (m<sup>3</sup>) of mortar in order to make the surface regularization in accordance with drawings and all requirements of the specifications as prescribed by section 04 03 08 “Historic Mortaring”.
    - .2 The amount includes, but is not limited to, the following:
      - .1 Preparation, presentation, and correction, if required, of shop drawings and technical data sheets of mortar;
      - .2 The mobilization of labour, tools, equipment and products needed to carry out the work;
      - .3 Filling of larger cavities using a lean concrete;
      - .4 Application of mortar of (at least) 25mm over the entire surface;
      - .5 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 *Construction / Demolition Waste Management and Disposal*;
      - .6 Any incidental expenses.
  - .5 Waterproof liquid membrane *Colphene LM300* or equivalent – Item 5.5
    - .1 The price for item 5.5 of the Bid Form is a price per square meter (m<sup>2</sup>) to supply and install a water-based single component rubberised liquid membrane

- (*Colphene LM300* or equivalent) over non exposed surface behind retaining walls in accordance with drawings and all requirements of the specifications as prescribed by section 07 14 16 “Waterproofing liquide membrane and drainage board”.
- .2 The amount includes, but is not limited to, the following:
    - .1 Preparation, presentation, and correction, if required, liquid membrane shop drawings and technical data sheets;
    - .2 The mobilization of labour, tools, equipment and products needed to carry out the work;
    - .3 The installation of waterproof liquid membrane according to the manufacturer's recommendation;
    - .4 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 *Construction / Demolition Waste Management and Disposal*;
  - .3 The following is excluded from this item:
    - .1 Drainage board *Sopradrain 10G* or equivalent (covered in item 5.6);
  - .6 Drainage boards *Sopradrain 10G* or equivalent – Item 5.6
    - .1 The price for item 5.6 of the Bid Form is a price per square meter (m<sup>2</sup>) to supply and install drainage boards (*Sopradrain 10G* or equivalent) over the waterproof liquid membranes to protect them before backfilling in accordance with drawings and all requirements of the specifications as prescribed by section 07 14 16 “Waterproofing liquide membrane and drainage board”.
    - .2 The amount includes, but is not limited to, the following:
      - .1 Preparation, presentation, and correction, if required, drainage board shop drawings and technical data sheets;
      - .2 The mobilization of labour, tools, equipment and products needed to carry out the work;
      - .3 The installation of drainage boards according to the manufacturer's recommendation;
      - .4 The treatment of surplus materials in accordance with the requirements of Section 01 74 21 *Construction / Demolition Waste Management and Disposal*;
  - .7 Perforated drain (200mm) and geotextile – Item 5.7
    - .1 The price for item 5.7 of the Bid Form is a price per linear meter (m) to supply and install performed drains, in accordance with the drawings and as directed by the Site Supervisor.
    - .2 The amount includes, but is not limited to, the following:
      - .1 Supply and drain installation including all necessary accessories such as the joints required for different sections;

- .2 Clear stone for drainage;
  - .3 Geotextile PVC (type 1) or PVC COEX (type 1) or PE (type 2), 180 kPa minimum;
  - .4 Grid connection for future drains that will come from other casemates;
  - .5 Geodesic survey of grid connexion to be presented to Site Supervisor;
  - .6 Site cleanup at completion of work;
  - .7 Any incidental expenses.
- .8 River stone (20-40mm ) – Item 5.8
- .1 The price for item 5.8 of the Bid Form is a fixed lump sum amount that includes supply and setting in place the river stone covering in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The preparation, presentation, and correction, if required, of compliance certificates of stones caliber;
    - .2 The mobilization of labour, tools, and equipment required to carry out the work;
    - .3 Supply, transportation and maintenance required for setting stones in place;
    - .4 Any incidental expenses.
- .9 Square Stone (150x150) – Item 5.9
- .1 The price for item 5.9 of the Bid Form is a fixed lump sum amount that includes supply and setting in place protection edge between river stone covering and grassing. 150x150 square stone will be supplied and set in place in accordance with the requirements of the specifications and drawings and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The preparation, presentation, and correction, if required, of compliance certificates of stones caliber;
    - .2 The mobilization of labour, tools, and equipment required to carry out the work;
    - .3 Supply, transportation and maintenance required for setting stones in place;
    - .4 Any incidental expenses.



**2.6 Item 6 – Wood elements**

- .1 New wood doors and cleaning and repainting of existing hardware – Item 6.1
  - .1 The price for item 6.1 of the Bid Form is a fixed lump sum amount for manufacturing and installing new doors at north entrance of Fort Lennox in accordance with drawings and all requirements of the specifications as prescribed by section 08 03 11 “Historic Period wood doors”.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The removal and transportation of existing doors to the craftsman who will manufacture new doors and the disposal of the old ones;
    - .2 The preparation, presentation, and correction, if required, of shop drawings and technical data sheets;
    - .3 Door fabrication, transportation and setting in place, considering all necessary adjustments;
    - .4 The mobilization of labour, tools, and equipment required to carry out the work;
    - .5 Any incidental expenses
  - .3 The following is excluded from this item:
    - .1 Hardware replacement provisioning (covered in item 6.2)
- .2 Hardware replacement provisioning – Item 6.2
  - .1 The price for item 6.2 of the Bid Form is a fixed lump sum amount for replacing hardware of new doors at north entrance of Fort Lennox in accordance with drawings and all requirements of the specifications as prescribed by section 08 03 11 “Historic Period wood doors”.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The preparation, presentation, and correction, if required, of shop drawings and technical data sheets of materials;
    - .2 Fabrication of new hardware in according to existing hardware, transportation and setting in place;
    - .3 The mobilization of labour, tools, and equipment required to carry out the work;
    - .4 Any incidental expenses.

**2.7 Item 7 – Electrical works**

- .1 Modifications of pipeline network and wiring – Item 7.1
  - .1 The price for item 7.1 of the Bid Form is a fixed lump sum amount that includes the modification of the electrical conduit and wiring runs.
  - .2 The amount includes, but is not limited to, the following:

- .1 the supply and installation of the conduit, the junction and pull boxes, the expansion joints, the spacers, the strap cables, the anchors, the electrical cables splicing kit including all material, the accessories, the hardware, the manpower and all necessary expenses required for a complete and functional installation.
- .3 The price also includes the removing of the existing conduits, junction and pull boxes, and accessories, and also the cable splices.

## 2.8 Item 8 – Landscaping

- .1 Top soil – Item 8.1
  - .1 The price for item 8.1 of the Bid Form is a price per square meter (m<sup>2</sup>) of topsoil, in accordance with the requirements of the specifications and drawings, and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The supply of materials, loading, transport, spreading, leveling, removal of stones, woody debris, and garbage, as well as the necessary improvements to render the material compliant to the plans and to the directives of the Site Supervisor;
    - .2 Any incidental expenses.
- .2 Laying Sod – Item 8.2
  - .1 The price for item 8.2 of the Bid Form is a price per square meter (m<sup>2</sup>) of sod, in accordance with the requirements of the specifications and drawings, and as directed by the Site Supervisor.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The supply and installation of material according to plans and as directed by the Site Supervisor;
    - .2 The repetition of sod laying on the surfaces covered by less than 75 % of growth measuring 150 mm in height;
    - .3 Site clean-up;
    - .4 Any incidental expenses.
- .3 Restoration of ramparts – Item 8.3
  - .1 The price for item 8.3 of the Bid Form is a fixed lump sum amount to restore ramparts after excavation works, waterproofing backside walls and below adjacent casemates and drainage system installation. This works should be done in accordance with the requirements of the specifications and drawings.
  - .2 The amount includes, but is not limited to, the following:
    - .1 The supply, set in place of materials, according to detail of talus to be rebuilt shown in drawings. This includes, but not limited, 100% coconut

- wire mesh, Macmat membrane, laying sod, eco gabion, filling materials, 20/100mm stone and all required vegetation to rebuilt talus such as existing conditions;
- .2 The mobilization of labour, tools, and equipment required to carry out the work;
  - .3 Site clean-up;
  - .4 Any incidental expenses.

**Part 3 Products**

**3.1 NOT USED**

- .1 Not Used.

**Part 4 Execution**

**4.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **Part 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 Site Supervisor 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 [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 Submit to Site Supervisor within seven (7) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .2 Submit Project Schedule to Site Supervisor within 5 working days of receipt of acceptance of Master Plan.

**1.4 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Site Supervisor will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

**1.5 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 Award.
  - .2 Mobilization.
  - .3 Shop Drawings, Samples.
  - .4 Excavation.
  - .5 Masonry work.
  - .6 Concreting.
  - .7 Backfill.
  - .8 Arch roof repair.
  - .9 Main gate replacement
  - .10 Improvements
  - .11 Correction of deficiencies.
  - .12 Final acceptance.

**1.6 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on weekly basis reflecting 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.

**1.7 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**

- .1      Promptly and according to a predetermined sequence such that the execution of works is not delayed, submit the required documents and samples to the Site Supervisor for inspection. A delay in this respect is not a sufficient reason to obtain an extension to the completion schedule of the Works and therefore no such request will be accepted.
- .2      Do not undertake work for which the submittal of documents and samples are required until the inspection of all documents submitted has been completely finished.
- .3      Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4      Where items or information is not produced in SI Metric units converted values are acceptable.
- .5      Review submittals prior to submission to Site Supervisor. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6      Notify Site Supervisor, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7      Verify field measurements and affected adjacent Work are co-ordinated.
- .8      Contractor's responsibility for submission of complete and accurate documents and samples to requirements of Contract Documents is not relieved by Site Supervisor's review of submittals.
- .9      Keep one reviewed copy of each submission on site.

**1.2                SHOP DRAWINGS AND PRODUCT DATA**

- .1      The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2      The shop drawings must bear the seal and signature of a qualified and authorized engineer, member in good standing of the *Ordre des ingénieurs du Québec*.
- .3      Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4      Allow seven (7) days for the Site Supervisor's review of each submission.

- .5 Adjustments made on shop drawings the Site Supervisor are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Site supervisor prior to proceeding with Work.
- .6 Make changes in shop drawings as the Site Supervisor may require, consistent with Contract Documents. When resubmitting, notify the Site Supervisor in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in [duplicate], containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Relationship to adjacent work.
- .9 After the Site Supervisor review, distribute copies.
- .10 Submit two (2) printed copies and one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Site Supervisor may reasonably request.
- .11 Submit two (2) printed copies and one (1) electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by the site Supervisor where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit two (2) printed copies and one (1) electronic copy copies of test reports for requirements requested in specification Sections and as requested by the Site supervisor.



- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 5 years of date of contract award for project.
- .13 Submit two (2) printed copies and one (1) electronic copy of certificates for requirements requested in specification Sections and as requested by the Site Supervisor.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 If upon review by the Site Supervisor, no errors or omissions are discovered or if only minor corrections are made, one (1) printed copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

### **1.3 SAMPLES**

- .1 Submit for review samples in [triplicate] as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to the Site Supervisor's site office.
- .3 Notify the Site Supervisor in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by the Site Supervisor are not intended to change Contract Price. If adjustments affect value of Work, state such in writing the Site Supervisor prior to proceeding with Work.
- .6 Make changes in samples which The Site Supervisor may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

### **1.4 MOCK-UPS**

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

### **1.5 PHOTOGRAPHIC DOCUMENTATION**

- .1 Not used.

**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                SECTION INCLUDED**

- .1 Contractor shall manage his operations so that safety and security of the public and of site workers always take precedence over cost and scheduling considerations.

**1.2                REFERENCES**

- .1 Canada Labour Code - Part II, Canadian Occupational Safety and Health Regulations.
- .2 Canadian Standards Association (CSA).
- .3 Workplace Hazardous Materials Information System (WHMIS).
- .4 Act Respecting Occupational Health and Safety, R.S.Q. Chapter S-2.1.
- .5 Construction Safety Code, S-2.1, r.4.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Site Supervisor, the CSST and the Association paritaire en santé et sécurité du secteur de la construction (ASP Construction) the site-specific safety program, as outlined in 1.8 at least 10 days prior to start of work. The Contractor must review his program during the course of the project if any change occurs in work methods or site conditions. The Site Supervisor may, after receiving the program or at any time during the project, ask the Contractor to update or modify the program in order to better reflect the reality of the construction site and activities. The Contractor must make the required changes before work begins.
- .3 Submit to Site Supervisor the site inspection sheet, duly completed, at the intervals indicated in 1.13.1.
- .4 Submit to Site Supervisor within 24 hours a copy of any inspection report, correction notice or recommendation issued by federal or provincial inspectors.
- .5 Submit to Site Supervisor within 24 hours an investigation report for any accident involving injury and any incident exposing a potential hazard.
- .6 Submit to Site Supervisor all safety data sheets for hazardous material to be used at the site at least three days before they are to be used.
- .7 Submit to Site Supervisor copies of all training certificates required for application of the safety program, in particular:
  - .1 General construction site safety and health courses;
  - .2 Safety officer attestations;
  - .3 First aid in the workplace and cardiopulmonary resuscitation;
  - .4 Work likely to release asbestos dust;
  - .5 Work in confined spaces;
  - .6 Lockout procedures;

- .7 Wearing and fitting of individual protective gear;
  - .8 forklift truck;
  - .9 positioning platform;
  - .10 Any other requirement of Regulations or the safety program.
- .8 Medical examinations : Wherever legislation, regulations, directives, specification or a safety program require medical examinations, Contractor must:
- .1 Prior to start-up, submit to Site Supervisor certificates of medical examination for all concerned supervisory staff and employees who will be on duty when the site opens.
  - .2 Thereafter, submit without delay certificates of medical examination for any newly hired concerned personnel as and when they start work at the site.
- .9 Emergency plan : The emergency plan, as defined in 1.8.3, shall be submitted to Site Supervisor at the same time as the site-specific safety program.
- .10 Notice of site opening : Notice of site opening shall be submitted to the Commission de la santé et de la sécurité du travail before work begins. A copy of such notice shall be submitted to Site Supervisor at the same time and another posted in full view at the site. During demobilization, a notice of site closing shall be submitted to the CSST, with copy to Site Supervisor.
- .11 Plans and certificates of compliance : Submit to the CSST and to Site Supervisor a copy signed and sealed by engineer of all plans and certificates of compliance required pursuant to the Construction Safety Code (S-2.1, r. 6), or by any other legislation or regulation or by any other clause in the specifications or in this contract. Copies of these documents must be on hand at the site at all times.
- .12 Certificate of compliance delivered by the CSST: The certificate of compliance is a document delivered by the CSST confirming that the contractor is in rule with the CSST, i.e. that he had pay out all the benefits concerning this contract. This document must be delivered to Site Supervisor at the end of the work.

#### **1.4 HAZARDS ASSESSMENT**

- .1 The contractor must identify all hazards inherent in each task to be carried out at the site.
- .2 The contractor must plan and organize work so as to eliminate hazards at source or promote mutual protection so that reliance on individual protective gear can be kept to a minimum. Where individual protection against falling is required, workers shall use safety harness that meets standard Can - CSA- Z-259.10 - M90. Safety belts shall not be used as protection against falling.
- .3 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.
- .4 All mechanical equipment shall be inspected before delivery to the site. Before using any mechanical equipment, submit to Site Supervisor a certificate of compliance signed by a qualified mechanic. Whenever he suspects a defect or accident risk, Site Supervisor may at any time order the immediate shut-down of equipment and require a new inspection by a specialist of his own choosing.

- .5 For use of equipment for lifting persons or materials, ensure that the inspections required by the standards are met and be able to provide a copy of certificates of inspection upon request of Representative of the Ministry.

## **1.5 MEETINGS**

- .1 Contractor decisional representative must attend any meetings at which site safety and health issues are to be discussed
- .2 Set up a site safety committee, and convene meetings every in accordance with the Construction Safety Code (S-2.1, r.4).

## **1.6 LEGAL AN REGULATION REQUIREMENTS**

- .1 Comply with all legislation, regulations and standards applicable to the site and its related activities.
- .2 Comply with specified standards and regulations to ensure safe operations at site containing hazardous or toxic materials.
- .3 Regardless of the publication date shown in the construction safety code, always use the most recent version.

## **1.7 PROJECT/SITE CONDITIONS**

- .1 At the site, the contractor must take account of the following specific conditions:
  - .1 Adjacent to a touristic site.
  - .2 Proximity to a watercourse (Moat) .

## **1.8 SAFETY AND HEALTH MANAGEMENT**

- .1 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 (R.S.Q., chapter S-2.1) and the Construction Safety Code (S-2.1, r.4).
- .2 Develop a site-specific safety program based on the hazards identified and apply it from the start of project work until close-out is completed. The safety program must take account of all information appearing in 1.7 and must be submitted to all parties concerned, in accordance with the provisions set forth in 1.3. At a minimum, the site-specific safety program must include :
  - .1 Company safety and health policy.
  - .2 A description of the work, total costs, schedule and projected workforce curve.
  - .3 Flow chart of safety and health responsibility.
  - .4 The physical and material layout of the site.
  - .5 First-aid and first-line treatment standards.
  - .6 Identification of site-specific hazards.
  - .7 Risk assessment for the tasks to be carried out, including preventive measures and the procedures for applying them.
  - .8 Training requirements.
  - .9 Procedures in case of accident/injury

- .10 Written commitment from all parties to comply with the prevention program.
- .11 A site inspection schedule based on the preventive measures.
- .3 The contractor must draw up an effective emergency plan based on the characteristics and constraints of the site and its surroundings. Submit the emergency plan to all parties concerned, pursuant to the provisions of 1.3. The emergency plan must include:
  - .1 Evacuation procedure;
  - .2 Identification of resources (police, firefighters, ambulance services, etc.);
  - .3 Identification of persons in charge at the site;
  - .4 Identification of those with first-aid training;
  - .5 Training required for those responsible for applying the plan;
  - .6 Any other information needed, in the light of the site characteristics.

### **1.9 RESPONSIBILITY**

- .1 No matter the size of the construction site or how many workers are present at the workplace, designate a competent person to supervise and take responsibility for health and safety. Take all necessary measures to ensure the health and safety of persons and property at or in the immediate vicinity of the site and likely to be affected by any of the work.
- .2 Take all necessary measures to ensure application of and compliance with the safety and health requirements of the contract documents, applicable federal and provincial regulations and standards as well as the site-specific safety program, complying without delay with any order or correction notice issued by the Commission de la santé et de la sécurité du travail.
- .3 Take all necessary measures to keep the site clean and in good order throughout the course of the work

### **1.10 COMMUNICATION AND POSTING**

- .1 Make all necessary arrangements to ensure effective communication of safety and health information at the site. As they arrive on site, all workers must be informed of their rights and obligations pertaining to the site specific safety program. The Contractor must insist on their right to refuse to perform work which they feel may threaten their own health, safety or physical integrity or that of other persons at the site. The Contractor must keep and update a written record of all information transmitted with signatures of all affected workers.
- .2 The following information and documents must be posted in a location readily accessible to all workers:
  - .1 Notice of site opening;
  - .2 Identification of principal Contractor;
  - .3 Company OSH policy;
  - .4 Site-specific safety program;
  - .5 Emergency plan;
  - .6 Data sheets for all hazardous material used at the site;

- .7 Minutes of site committee meetings;
- .8 Names of site committee representatives;
- .9 Names of those with first-aid training;
- .10 Action reports and correction notices issued by the CSST

#### **1.11 UNFORESEEN CIRCUMSTANCES**

- .1 Whenever a source of danger not defined in the specifications or identified in the preliminary site inspection arises as a result of or in the course of the work, immediately suspend work, take appropriate temporary measures to protect the workers and the public and notify Site Supervisor, both verbally and in writing. Then the Contractor must modify or update the site specific safety program in order to resume work in safe conditions.

#### **1.12 HEALTH/SAFETY/HYGIENE/ENVIRONNEMENTAL SPECIALIST**

- .1 At the very outset of construction, hire a qualified person whose duties will be to ensure compliance with and application of all rules, regulations and standards and all contractual requirements.
- .2 Provide this person with the authority, resources and tools needed to perform his/her duties.
- .3 The person selected shall:
  - .1 Have in-depth knowledge of legislation and regulations applicable to the site.
  - .2 Develop and disseminate a safety orientation program for all site workers.
  - .3 Ensure that no worker is admitted to the site without having taken the safety orientation program and met all the training requirements of the applicable legislation and the site-specific safety program.
  - .4 Inspect the work and ensure compliance with all regulatory requirements and those of the contract documents or the site-specific safety program.
  - .5 Keep a daily log of actions taken and submitting a copy to Site Supervisor each week.

#### **1.13 INSPECTION OF SITE AND CORRECTION OF HAZRADOUS SITUATIONS**

- .1 Inspect the work site and complete the site inspection sheet at least once week.
- .2 Immediately take all necessary measures to correct any lapses from legislative or regulatory requirements and any hazards identified by a government inspector, by the Site Supervisor, by the site safety and health coordinator or during routine inspections.
- .3 Submit to Site Supervisor written confirmation of all measures taken to correct lapses and hazardous situations.
- .4 Give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order interruption 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 site workers and environmental protection take precedence over cost and scheduling considerations.

- .5 Without limiting the scope of sections 1.8 and 1.9, Site Supervisor may order cessation of work if, in his/her view, there is any hazard or threat to the safety or health of site personnel or the public or to the environment.

**1.14 BLASTING**

- .1 Blasting or other use of explosives is not allowed.

**1.15 POWDERACTUATED DEVICES**

- .1 Use of power hammers and other explosive-actuated devices must be authorized by Site Supervisor.
- .2 Any person using a power hammer shall hold a training certificate and meet all requirements of Section 7 of the Construction Safety Code (S-2.1, r. 6).
- .3 Any other explosive-actuated device shall be used in accordance with the manufacturer's directions and applicable standards and regulations.

**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        REFERENCES**

- .1        Definitions:
  - .1        Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2        Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

**1.2        FIRES**

- .1        Fires and burning of rubbish on site is not permitted.

**1.3        DDISPOSAL OF WASTE**

- .1        Do not bury on site rubbish and waste materials, which must be disposed of in appropriate landfill sites in accordance with section 01 74 21 Construction/Demolition Waste Management and Disposal.

**1.4        DRAINAGE**

- .1        Provide erosion control plan and indicate the control measures implemented, including monitoring and reporting requirements to assure that control measures are in compliance with Federal, Provincial, and Municipal laws and regulations.
- .2        Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sedimentations control plan.
- .3        Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .4        Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .5        Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.5        SITE CLEARING AND PLANT PROTECTION**

- .1        Protect trees and plants on site and adjacent properties as indicated.
- .2        Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3        Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

- .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.

## **1.6 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Use waterway beds for borrow material only after written receipt of approval from the Site Supervisor.
- .3 Waterways to be kept free of excavated fill, waste material and debris.
- .4 Do not skid logs or construction materials across waterways.
- .5 Blasting is not allowed on the site.

## **1.7 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area. Provide temporary enclosures where directed by the Site Supervisor.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

## **1.8 NOTIFICATION**

- .1 The Site Supervisor will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform the Site Supervisor of proposed corrective action and take such action for approval the Site Supervisor. Take action only after receipt of written approval by the Site Supervisor.
- .3 The Site Supervisor will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

## **Part 2 Products**

### **2.1 See annexe 1**

- .1 See annexe 1.

**Part 3            Execution**

**3.1                See annexe 1**

.1                See annexe 1.

**ANNEXE 1**

**DEVIS PROTECTION DE L'ENVIRONNEMENT**

AGENCE PARCS CANADA

RÉFECTION DE L'ARCHE D'ENTRÉE NORD FORT  
LENNOX

ÉMISSION POUR SOUMISSION

DEVIS PROTECTION DE L'ENVIRONNEMENT

CLAUSES TECHNIQUESTABLE DES MATIÈRES

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La protection de l'environnement est assurée conformément aux stipulations du présent devis, qui complète ou invalide certains articles du Cahier des Charges et Devis Généraux (CCDG). Par conséquent, l'entrepreneur doit respecter les exigences du présent document, en plus des stipulations du CCDG – Infrastructures routières – Construction et réparation, édition 2015.

#### **1.0 OBLIGATION RÉGLEMENTAIRE DE L'ENTREPRENEUR**

Pour tous travaux et activités envisagés à l'extérieur du territoire géré par Parcs Canada, qui sont assujetties à un ou des règlements relevant d'un ministère, il revient à l'entrepreneur d'obtenir auprès des organismes concernés les certificats d'autorisation et les permis nécessaires pour réaliser ses travaux.

L'entrepreneur doit fournir une copie de ces documents d'autorisation au surveillant de chantier. De plus, l'entrepreneur doit prévoir les frais inhérents à l'obtention et au respect des certificats requis et les délais supplémentaires encourus par l'obtention de ces certificats d'autorisation, le cas échéant.

#### **2.0 DÉVERSEMENT ACCIDENTEL DE PRODUIT PÉTROLIER**

L'entrepreneur informe immédiatement le surveillant de chantier, les autorités de Parcs Canada, et Urgence Environnement, de tout accident pouvant perturber l'environnement. Numéros en cas d'urgence :

- Environnement Canada : (514) 283-2333;
- Réseau d'alerte : 1 866 283-2333;
- Urgence environnement Québec : 1 866 694-5454;
- Parc National de la Mauricie (819) 536-2638.
- Surveillant de chantier :

Comme il est stipulé à l'article 10.4.2 du CCDG, l'entrepreneur dispose en permanence sur le chantier d'une trousse d'urgence de récupération de produit pétrolier pour chacun des sites de travail. Les trousse doivent comprendre suffisamment de rouleau absorbant, litières absorbantes et récipients pour permettre d'intervenir sur la largeur du cours d'eau ou de permettre de confiner les produits pétroliers à l'intérieur du périmètre de la machinerie en cause, en aménageant une estacade flottante.

Les trousse doivent être disponibles à proximité du cours d'eau et de la machinerie, et doivent être facilement accessibles en tout temps pour une intervention rapide. Tout déversement sur le chantier doit être déclaré. Le sol contaminé doit être quantifié et récupéré. La preuve de son transport dans un site autorisé doit être remise au surveillant.

Tout réservoir, contenant d'essence ou d'huile et tout engin stationnaire (pompe, génératrice, etc.) fonctionnant à l'essence ou au diesel, et situé à moins de soixante (60) mètres du milieu hydrique, doit être installé dans un bac récupérateur des fuites dont la capacité équivaut à 150 % du volume du réservoir.

### 3.0 ENTRETIEN ET CIRCULATION DE LA MACHINERIE

#### 3.1 Entretien de la machinerie

Avant la mobilisation de la machinerie à l'intérieur du territoire du parc celle-ci doit être inspectée et nettoyée afin de prévenir les fuites d'hydrocarbure ou autre lubrifiant. L'entretien et le nettoyage de la machinerie ainsi que son ravitaillement en carburant et en lubrifiant doivent être effectués à une distance d'au moins soixante (60) mètres d'un milieu hydrique. Cette distance remplace celle de quinze (15) mètres stipulée à l'article 10.4.3.1 du CCDG.

#### 3.2 Circulation sur le chantier

L'entrepreneur évite d'utiliser de la machinerie lourde dans les zones sensibles à l'érosion de surface et au glissement de terrain. À cet effet, il porte une attention particulière aux rives des cours d'eau milieux humides et lacs. Il est interdit de circuler avec de la machinerie lourde dans le littoral des cours d'eau, lacs et milieux humides.

Éloigner la machinerie du cours d'eau dès qu'elle n'est plus utilisée. De plus, le soir et la fin de semaine, remettre la machinerie lourdes à plus de vingt (20) mètres du cours d'eau.

#### 3.3 Circulation hors emprise

Pour toute sortie d'emprise, (chemin d'accès temporaire, aire de rebut, aire de manutention temporaire), l'entrepreneur doit aviser et obtenir l'autorisation du surveillant avant d'utiliser un site. L'approbation du surveillant de chantier ne dégage pas l'entrepreneur de ses responsabilités légales, tel que stipulé aux articles 6.5 et 6.9 du CCDG.

### 4.0 PROTECTION DES COURS D'EAU, MILIEUX HUMIDES ET LACS

En plus de se conformer aux exigences de l'article 10.4 du CCDG, l'entrepreneur respecte les clauses du présent devis. Ces mesures de protection ont pour but de réduire l'érosion et la sédimentation dans les cours d'eau ainsi que de protéger l'habitat de la faune. Les termes spécifiques se rapportant aux différents éléments des cours d'eau sont illustrés au dessin normalisé de l'annexe 1.

#### 4.1 Planification du drainage lors des travaux et contrôle de l'érosion

Partout où des travaux sont entrepris ayant comme conséquence de déstabiliser le sol, il est de la responsabilité de l'entrepreneur de planifier le réseau de drainage de ces zones perturbées et prévoir des mesures de stabilisation temporaires et des dispositifs de captage des sédiments avant leur acheminement dans les cours d'eau, lacs et milieux humides.

Les dispositifs doivent être installés à la sortie des fossés reprofilés, des ponceaux et aux endroits où l'eau s'écoule sur le chantier de façon temporaire ou continue. Ces dispositifs sont les barrières à sédiments, les bassins de sédimentation ou autre technique efficace (dispositifs illustrés en annexes 2, 3, et 4).

L'entrepreneur présente un plan de drainage et de contrôle de l'érosion au surveillant dix (10) jours avant le début des travaux pouvant entraîner l'apport en sédiments dans les cours d'eau, lacs et milieux humides.



#### 4.1.1 Barrière à sédiments

Conformément à l'article 10.4.3.2.2 du CCDG et à l'annexe 2 ci-jointe, l'entrepreneur doit installer des barrières à sédiments au pied des pentes de talus avec sols instables de manière à éviter l'apport de sédiments dans la douve. En présence d'un talus d'une longueur de dix (10) mètres et plus, l'entrepreneur devra installer une seconde barrière à sédiments en milieu de pente.

#### 4.1.2 Bassin de sédimentation, filtre naturel ou méthodes alternatives

##### 4.1.2.1 Bassin de sédimentation

Conformément à l'article 10.4.3.2.3 et à l'annexe 4 ci-jointe, l'entrepreneur doit aménager des bassins de sédimentation durant les travaux de pompage des batardeaux, de manière à éviter l'apport de sédiments dans les cours d'eau, les milieux humides ou dans les lacs. La capacité minimale d'un bassin est calibrée en fonction du débit des eaux pompées. Il est interdit d'aménager ces dispositifs dans le littoral d'un cours d'eau, d'un lac ou d'un milieu humide.

Lorsqu'un bassin de sédimentation est rempli à 50 %, il doit être nettoyé. De plus, un dernier nettoyage doit être réalisé à la fermeture temporaire d'un chantier ainsi qu'à la fermeture permanente. Un nettoyage préventif doit également être réalisé lors d'une alerte météorologique annonçant une forte pluie.

##### 4.1.2.2 Méthodes alternatives

Il existe sur le marché différents produits qui permettent de contrôler et de retenir les sédiments sur un chantier de construction (Ex : poche de décantation des sédiments et bassin de décantation portatif etc.). Si l'entrepreneur prévoit utiliser ce genre de produit, il devra avoir l'autorisation du surveillant avant de débiter les travaux.

#### 4.1.3 Bermes filtrantes et trappes à sédiments

Conformément à l'article 10.4.3.2.1 du CCDG et au dessin II-9-19 ci-joint, des bermes filtrantes et trappes à sédiments doivent être aménagées durant les travaux de terrassement, de manière à limiter l'apport de sédiments dans les cours d'eau, lacs et milieux humides.

Lorsque la trappe à sédiments est remplie à 50 %, les sédiments retenus doivent être enlevés et disposés dans un endroit autorisé à l'extérieur du Parc et, lorsque nécessaire, le matériau filtrant doit être nettoyé ou remplacé.

#### **4.2 Protection temporaire des talus**

Dans les talus sujets à l'érosion de surface, particulièrement sur les rives, l'entrepreneur doit mettre en place des mesures temporaires de protection. Celles-ci permettront d'éviter l'apport en sédiments dans le cours d'eau, le lac ou toute autre étendue d'eau. Des membranes géotextiles devront être mises en place pour la stabilisation temporaire. Les membranes de plastique (polyéthylène) sont interdites.

Leur dépôt temporaire ou permanent devrait être réalisé dans des endroits présélectionnés à au moins vingt (20) mètres du plan d'eau.

#### **4.3 Protection des rives et du littoral des cours d'eau, lacs et milieux humides**

Les mesures prévues à la présente section visent à protéger le littoral et les rives des milieux hydriques. Ne réaliser aucun travail de terrassement ou d'excavation près des cours d'eau lors des périodes de crues ou lors de fortes pluies.

##### **4.3.1 Eau de pompage**

Si le site de construction est isolé par un batardeau et que le pompage des eaux d'infiltration est nécessaire, celles-ci doivent être évacuées, tel que stipulé à l'article 10.4.3.2 du CCDG. De plus, les eaux de pompage rejetées au cours d'eau doivent contenir moins de 25 mg/l de matières en suspension.

#### **5.0 MATÉRIAU DE REBUT**

En plus de se conformer à l'article 11.4.7 du CCDG, l'entrepreneur est tenu de respecter ce qui suit.

##### **5.1 Élimination de rebut**

###### **5.1.1 A l'intérieur des limites du lieu historique**

Le déversement de rebut ou de déchet provenant du chantier est interdit à l'intérieur des limites du lieu historique.

###### **5.1.2 Responsabilité de l'entrepreneur**

Il est de la responsabilité de l'entrepreneur de disposer des rebus en conformité réglementation en vigueur. L'entrepreneur doit obtenir, par écrit, les autorisations

des propriétaires et des organismes concernés par la réglementation (ex : MDDEFP, etc.).

L'entrepreneur fournit une copie des autorisations requises cinq jours ouvrables avant de procéder à la disposition de rebut.

## **5.2 Propreté sur le chantier**

L'entrepreneur maintient le chantier en bon ordre et exempt de matériau de rebut et de débris accumulés. Ces matériaux et débris sont évacués du chantier à intervalles réguliers.

## **6.0 DÉBOISEMENT**

Le déboisement se limite aux superficies nécessaires autorisées pour la réalisation des travaux.

L'identification précise de la zone de déboisement (réalisés conjointement avec les autorités de Parcs Canada par marquage et balisage, est obligatoire. Le plan de balisage des zones de déboisement doit être soumis au surveillant pour approbation avant le début des travaux d'abattage.

Le déboisement est exécuté manuellement afin que le point de chute des arbres abattus soit le plus éloigné possible des cours d'eau. Aucun arbre ou résidu de coupe ne doit tomber dans les cours d'eau. Si tel est le cas, les débris sont enlevés manuellement en occasionnant le moins de dérangement possible au lit et aux berges des cours d'eau.

## **7.0 FEUX**

Les feux et le brûlage des déchets sont interdits.

## **8.0 STABILISATION DES SOLS AVANT LA PÉRIODE HIVERNALE**

A partir du 15 octobre, l'entrepreneur doit stabiliser temporairement toutes les surfaces sensibles à l'érosion de surface, ainsi que les sections occupées par les ouvrages provisoires avant les premières chutes de neige. Pour ce faire, il doit stabiliser les surfaces sensibles à l'aide de membrane géotextile et enrocher jusqu'à la limite des eaux.

## **9.0 PROTECTION CONTRE LE BRUIT**

En plus des mesures déjà prévues au CCDG à l'article 10.4.4, l'entrepreneur doit contrôler les niveaux de bruit dans les zones habitées durant la phase de construction par l'application des mesures suivantes :

- l'horaire de transport et d'utilisation de la machinerie respecte la réglementation des municipalités et de la municipalité régionale de comté (MRC);
- les équipements et la machinerie lourde sont maintenus en bon état de fonctionnement (silencieux adéquat, entretien régulier, etc.) afin de conserver leur niveau de bruit le plus bas possible;

- le fonctionnement de tout engin motorisé est arrêté s'il n'est pas utilisé pendant une certaine période de temps (par exemple, la pause du midi et autre, etc.);
- dans la mesure du possible, les équipements fixes sont localisés loin des endroits sensibles au bruit ou de manière à réduire l'impact causé sur le niveau sonore ambiant;
- les dispositifs d'atténuation du bruit, dont sont munis certains équipements, sont utilisés (par exemple, fermer les panneaux latéraux des compresseurs, etc.).

#### **10.0 RESTAURATION DES SOLS REMANIÉS ET STABILISATION FINALE**

Lorsque les travaux sont terminés, l'entrepreneur procède à la mise en place de la terre végétale récupérée et mise en réserve au début des travaux (aucune importation de terre végétale sur le territoire du parc ne sera permise), afin de recouvrir les surfaces de sol remaniées. Si un délai est nécessaire, les moyens de contrôle de l'érosion doivent demeurer en place afin de capter tout matériau érodé.  
Remettre dans leur état initial, le lit et les berges des cours d'eau.

La stabilisation finale sera effectuée avec des matelas anti-érosion. Voir annexe 5.

#### **11.0 PLAN D'ACTION POUR LA PROTECTION DE L'ENVIRONNEMENT**

En référence aux articles 6.6.3 et 10.4.3.5 du CCDG, il est demandé à l'entrepreneur de présenter au surveillant (pour approbation par les autorités du parc) un plan d'action pour protéger l'environnement en général, et plus spécifiquement, pour éviter l'apport de sédiments dans les cours d'eau ou dans les lacs avoisinants causé par les matériaux susceptibles d'être érodés et transportés sur le chantier.

Ce plan d'action doit être présenté sous forme de croquis à l'aide des plans de construction de format réduit (ou tout autre document équivalent) montrant la localisation et la nature des méthodes de contrôle de l'érosion proposées. L'entrepreneur doit démontrer dans son plan d'action de quelle façon il entend appliquer les prescriptions du présent devis pour éviter tout dommage à l'environnement. Le plan d'action contient notamment :

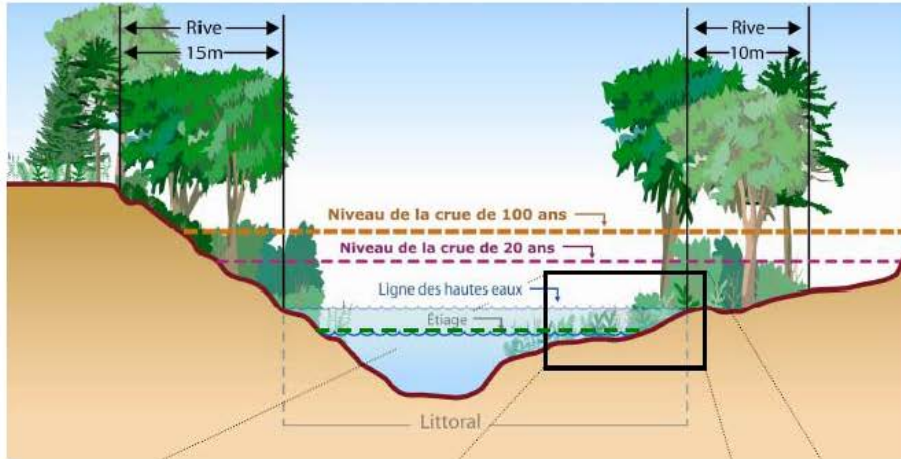
- identification du responsable en environnement (organigramme de communication du chantier);
- rencontre d'information afin de transmettre les exigences environnementales du projet aux travailleurs. Cette rencontre est sous la responsabilité de l'entrepreneur et, si nécessaire, un représentant du Parc pourra être sur place afin de répondre aux questions;
- ordonnancement des travaux;
- indication des sites nécessitant la délimitation physique (ruban, clôture, etc.) et des bandes riveraines des cours d'eau et lacs où le couvert végétal doit être conservé. La délimitation finale du périmètre des travaux sera effectuée avec les responsables du Parc;
- détermination des fossés qui doivent être détournés vers des zones de végétation;
- utilisation et combinaison des méthodes de contrôle de l'érosion prescrite dans le présent devis pour les travaux, les aires de stockage et les aires de rebuts;

- prévision des zones à stabiliser sans délai et à recouvrir avec des membranes géotextile ou matelas anti-érosion;
- mise en place et démantèlement des ouvrages en milieu hydrique;
- plans d'ouvrages provisoires;
- surveillance météo;
- plan d'aménagement des aires de rebuts ou autres site utilisés à l'extérieur de l'emprise routière (volume de matériaux projetés, chemins d'accès, superficie utilisée, qualité des sols sous-jacents, localisation des cours d'eau et des lacs, protection des arbres, terrassement, etc.);
- méthode d'intervention en cas de déversement accidentel de produits pétroliers;
- gestion des matériaux contaminés, le cas échéant;
- gestion du bruit;
- planification pour la suspension des travaux durant l'hiver;
- dispositif pour éviter que les poissons ne se retrouvent dans le système de pompage;
- Etc.

Dès le début des travaux, l'entrepreneur doit avoir en sa possession sur le chantier le matériel nécessaire pour réaliser les interventions prescrites au présent devis. L'entrepreneur doit intervenir immédiatement pour tout événement jugé dommageable par le surveillant ou susceptible de causer un dommage à l'environnement.

Aviser, dans les plus brefs délais, le responsable de chantier de tout changement des modalités de réalisation du projet (échancier, plan, etc.) ou d'impact non prévu, notamment sur l'habitat du poisson

## ANNEXE 1 - LEXIQUE



**Berge** : partie du bord plus ou moins escarpé d'une eau courante ou stagnante, et pouvant être ou étant submergée sans que les eaux débordent.

**Cours d'eau** : toute masse d'eau qui s'écoule dans un lit avec un débit régulier ou intermittent, y compris ceux qui ont été créés ou modifiés par une intervention humaine, ainsi que le fleuve Saint-Laurent et le golfe du Saint-Laurent, de même que toutes les mers qui entourent le Québec, à l'exception du fossé de voie publique ou privée, du fossé mitoyen et du fossé de drainage.

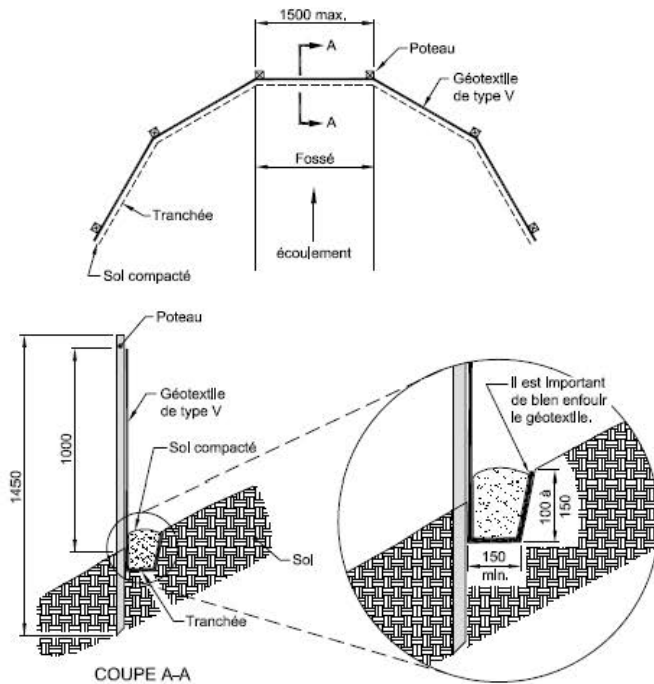
**Ligne naturelle des hautes eaux (LNHE)** : correspond à l'endroit où l'on passe d'une prédominance de plantes aquatiques à une prédominance de plantes terrestres ou, s'il n'y a pas de plantes aquatiques, à l'endroit où les plantes terrestres s'arrêtent en direction du plan d'eau;

**Littoral** : portion de terrain située entre la ligne des hautes eaux [LNHE] et la limite inférieure des plantes submergées.

**Milieu hydrique** : cours d'eau à débit régulier ou intermittent, lac, étang, marais, marécage ou tourbière.

**Rive (bande riveraine)** : la rive est une bande de terre qui borde les lacs et les cours d'eau et qui s'étend l'intérieur des terres à partir de la ligne des hautes eaux. La largeur de la rive à protéger se mesure horizontalement. La rive a un minimum de 10 m lorsque la pente est inférieure à 30 % ou lorsque la est supérieure à 30 % et présente un talus de moins de 5 m de hauteur. La rive a un minimum de 15 m lorsque la pente est continue et supérieure à 30 % ou lorsque la pente est supérieure à 30 % et talus de plus de 5 m de hauteur. La largeur de la rive pourrait être supérieure si le schéma et de développement de la MRC le prescrit.

### ANNEXE 2 - BARRIÈRE À SÉDIMENTS

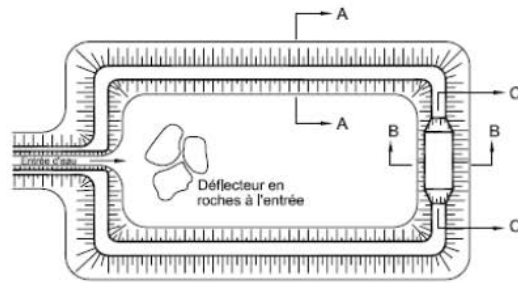


**Note :**

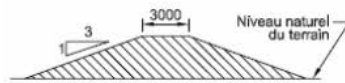
- les cotes sont en millimètres.

#### Installation d'une barrière à sédiments munie d'un géotextile

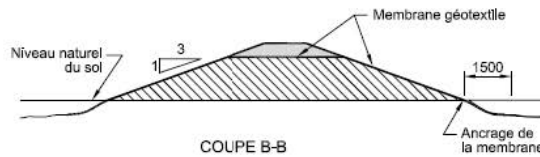
### ANNEXE 3 - BASSIN DE SÉDIMENTATION



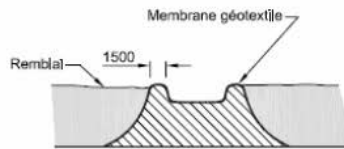
Bassin de sédimentation



COUPE A-A



COUPE B-B



COUPE C-C

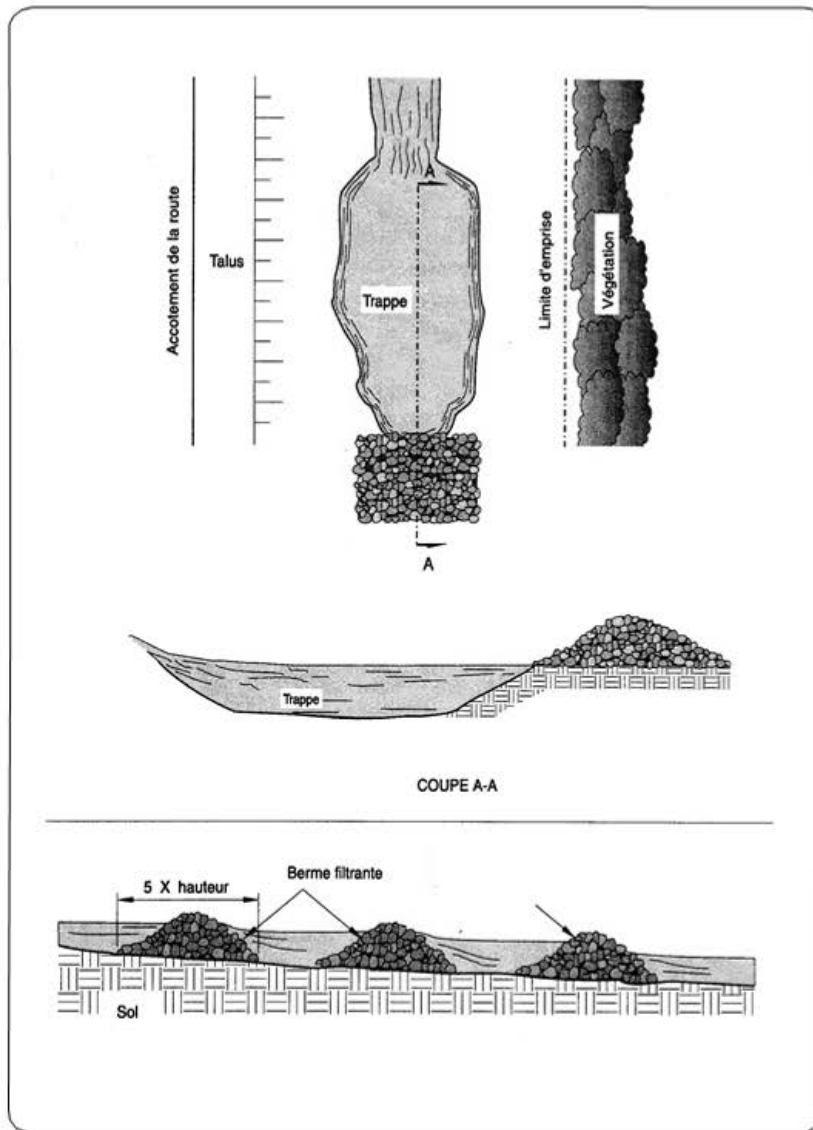
Déversoir sortie d'eau en pierre

**Notes :**

- cet ouvrage doit être planifié et prévu dans les plans et devis;
- l'emprise nécessaire à son installation doit être prévue et acquise à cette fin, le cas échéant.



**Annexe 4 - Berme filtrante et trappe à sédiments**



## **Annexe 5 – Matelas anti-érosion**

### **MÉTHODE D'INSTALLATION DES MATELAS ANTI-ÉROSION :**

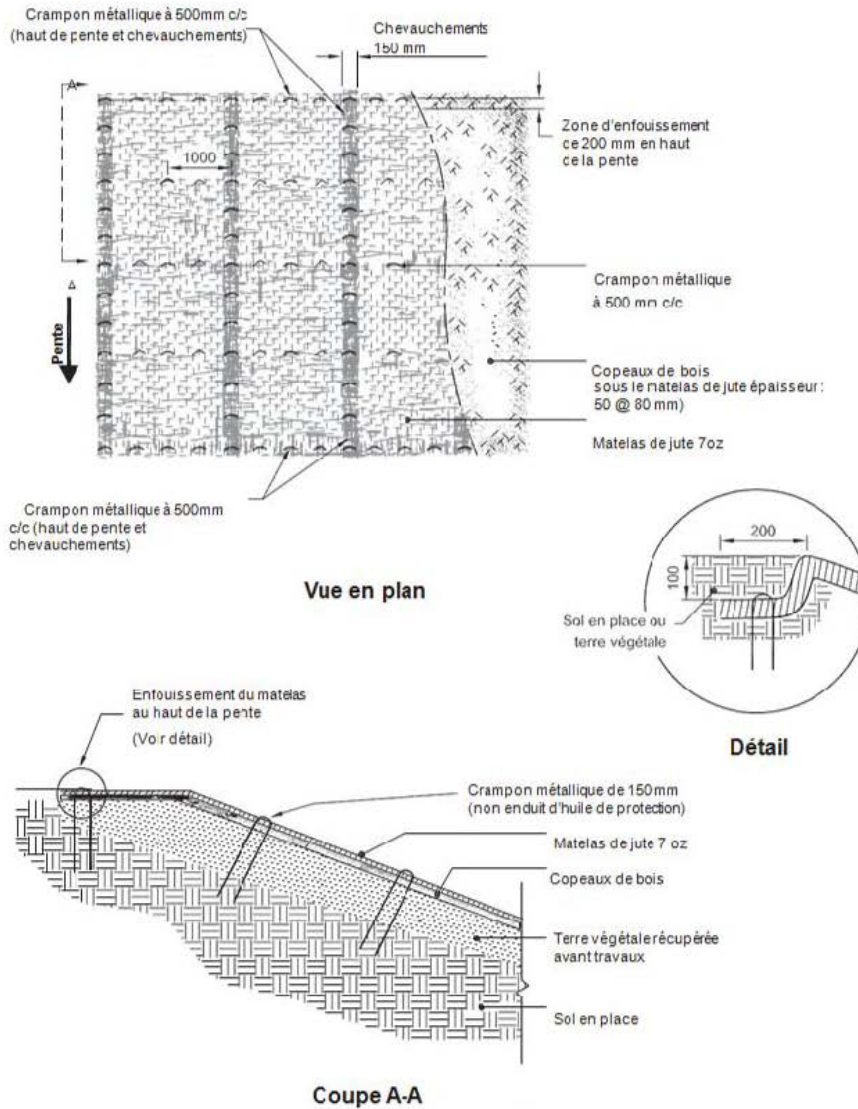
- Nivelier la pente, remplir tous les vides et égaliser pour éliminer tout creux ou saillie.
- Placer une épaisseur de 50 @ 80 mm de copeaux de bois sur les surfaces à restaurer ;
- Installer les matelas de jute 7 oz. immédiatement après la mise en place des copeaux de bois;
- Dérouler le matelas en débutant par le haut de la pente;
- Enfouir le matelas dans le haut du talus et l'ancrer solidement avec des agrafes en « U » d'une longueur de 15 mm plantées aux 60 cm c/c;
- Fixer par la suite les agrafes à intervalles réguliers d'environ 500 mm c/c et de manière plus serrée dans les fortes pentes;
- S'assurer que le matelas soit toujours en contact avec le sol : ne pas trop tendre le matelas;
- Superposer les jonctions des matelas, en respectant le sens de l'écoulement de l'eau, d'un minimum de 150 mm dans les pentes modérées et de 300 mm dans le fond d'un fossé et dans les pentes fortes.

### **Remarque :**

Les matériaux suivants seront fournis par le Parc et disponibles à l'entrepôt de Saint-Mathieu-du-Parc :

- Copeaux de bois provenant des travaux d'entretien à l'intérieur du Parc;
- Matelas de jute 7 oz. avec des ouvertures de maille correspondante à la photo ci-joint ;
- Agrafes en « U » d'une longueur de 150 mm non enduit d'huile de protection;

**MATELAS ANTI-ÉROSION**



**Remarque:**  
Toujours installer les rouleaux dans le sens de l'écoulement de l'eau.

Grosneur des mailles pour le matelas de jutes de 7 oz



I

**END OF SECTION**

**Part 1            General**

**1.1                INSPECTION**

- .1     Allow the Site Supervisor access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2     Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by the Site Supervisor instructions, or law of Place of Work.
- .3     If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4     The Site Supervisor will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, the Site Supervisor shall pay cost of examination and replacement.

**1.2                INDEPENDENT INSPECTION AGENCIES**

- .1     The Parks Canada Agency (PCA) will be responsible for engaging the services of independent testing and inspection bodies (lab). The cost of these services will be borne by the APC. This does not absolve the Contractor to carry out tests to meet contractual requirements.
- .2     Provide equipment required for executing inspection and testing by appointed agencies.
- .3     Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4     If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Site Supervisor at no cost to the Site Supervisor. Pay costs for retesting and reinspection.

**1.3                ACCESS TO WORK**

- .1     Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2     Co-operate to provide reasonable facilities for such access.

**1.4                PROCEDURES**

- .1     Notify appropriate agency and the Site Supervisor in advance of requirement for tests, in order that attendance arrangements can be made.
- .2     Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

## **1.5 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by the Site Supervisor as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of the Site Supervisor it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by the Site Supervisor .

## **1.6 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by the Site Supervisor and may be authorized as recoverable.

## **1.7 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations as specified in specific Section acceptable to the Site Supervisor.
- .3 Prepare mock-ups for the Site Supervisor's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 Mock-ups may remain as part of Work.

## **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                INSTALLATION AND REMOVAL**

- .1    Provide temporary utilities controls in order to execute work expeditiously.
- .2    Remove from site all such work after use.

**1.2                DEWATERING**

- .1    Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

**1.3                WATER SUPPLY**

- .1    Provide continuous supply of potable water for construction use.
- .2    Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

**1.4                TEMPORARY HEATING AND VENTILATION**

- .1    Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2    Provide temporary heat and ventilation in enclosed areas as required to:
  - .1    Facilitate progress of Work.
  - .2    Protect Work and products against dampness and cold.
  - .3    Prevent moisture condensation on surfaces.
  - .4    Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5    Provide adequate ventilation to meet health regulations for safe working environment.
- .3    Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .4    Ventilating:
  - .1    Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2    Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  - .3    Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  - .4    Ventilate storage spaces containing hazardous or volatile materials.
  - .5    Ventilate temporary sanitary facilities.
  - .6    Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.



- .5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .6 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

**1.5 TEMPORARY POWER AND LIGHT**

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

**1.6 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

**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                INSTALLATION AND REMOVAL**

- .1     Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2     Identify areas which have to be gravelled to prevent tracking of mud.
- .3     Indicate use of supplemental or other staging area.
- .4     Provide construction facilities in order to execute work expeditiously.
- .5     Remove from site all such work after use.

**1.2                SCAFFOLDING**

- .1     Scaffolding in accordance with CAN/CSA-S269.2.
- .2     Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, and temporary stairs and ensure proper maintenance throughout the duration of the Works.

**1.3                HOISTING**

- .1     Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2     Hoists and cranes to be operated by qualified operator.

**1.4                SITE STORAGE/LOADING**

- .1     Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2     Do not load or permit to load any part of Work with weight or force that will endanger Work.
- .3     The wood bridge is 20 tonnes. Truck axle most not exceed 5 tonnes.

**1.5                CONSTRUCTION PARKING**

- .1     Parking will not be permitted on site.
- .2     Provide and maintain adequate access to project site.
- .3     Clean runways areas where used by Contractor's equipment.

**1.6                SECURITY**

- .1     Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

**1.7 OFFICES**

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

**1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

**1.9 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

**1.10 CONSTRUCTION SIGNAGE**

- .1 No signs indicating the names of the Contractor and consultants is permitted on the construction site.

**1.11 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**1.12 TEMPORARY PROTECTION OF THE WORK**

- .1 Considering the timeframe allowed for completion of the work as well as the start and end of construction, the Contractor shall provide for the adequate protection of the structures under ambient conditions as specified in the Contract.
- .2 This protection should allow completion of the work as well as curing under temperate and controlled ambient conditions.

**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                INSTALLATION AND REMOVAL**

- .1    Provide temporary controls in order to execute Work expeditiously.
- .2    Remove from site all such work after use.

**1.2                HOARDING**

- .1    Erected around work site a temporary steel fence, 2.4 m high, lined inside with a dust net.
- .2    Provide lockable access gates for trucks and at least one pedestrian gate as indicated and in accordance with traffic restrictions on adjacent streets. Provide locks and keys for the gates.
- .3    Erect where required and maintain pedestrian walkways, as indicated on plans, including roof and side covers, complete with signs and electrical lighting as required by law.
- .4    Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

**1.3                GUARD RAILS AND BARRICADES**

- .1    Provide and install secure, rigid guard rails and barricades around deep excavations.

**1.4                DUST TIGHT SCREENS**

- .1    Provide dust tight screens or [insulated] partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2    Maintain and relocate protection until such work is complete.

**1.5                ACCESS TO SITE**

- .1    Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

**1.6                FIRE ROUTES**

- .1    Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.7                PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

- .1    Protect surrounding private and public property from damage during performance of Work.
- .2    Be responsible for damage incurred.

**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                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        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 Remove and replace defective and non-conforming Work.
- .4 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .5 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

**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                PROJECT CLEANLINESS**

- .1      Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2      Remove waste materials from site at daily regularly scheduled times.
- .3      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4      Provide on-site containers for collection of waste materials and debris.
- .5      Dispose of waste materials and debris off site.
- .6      Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .7      Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .8      Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.2                FINAL CLEANING**

- .1      When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2      Remove waste products and debris and leave Work clean and suitable for occupancy.
- .3      Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4      Remove waste products and debris.
- .5      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6      Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .7      Remove dirt and other disfiguration from exterior surfaces.

**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                WASTE MANAGEMENT GOALS**

- .1    Prior to start of Work conduct meeting with the Site Supervisor to review and discuss Parks Canada Agency (PCA) waste management goals
- .2    PCA's waste management goal: gérer les déchets issus de travaux de rénovation et de démolition dans les bâtiments appartenant à la Couronne, d'une manière respectueuse de l'environnement. Cette cible est en accord avec la Directive sur l'écologisation des immeubles de Parcs Canada.
- .3    Prior to project completion provide the Site Supervisor documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .4    Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .5    Protect environment and prevent environmental pollution damage.

**1.2                DEFINITIONS**

- .1    Class III: non-hazardous waste - construction renovation and demolition waste.
- .2    Inert Fill: inert waste - exclusively asphalt and concrete.
- .3    Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .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: act of keeping different types of waste materials separate beginning from the point they became waste.

### **1.3 SUBMITTALS**

- .1 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
  - .1 Failure to submit could result in hold back of final payment.
  - .2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
  - .3 For each material reused, sold or recycled from project, include quantity in tonnes and the destination.
  - .4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

### **1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by the Site Supervisor
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .4 Protect structural components not removed and salvaged materials from movement or damage.
- .5 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
  - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

### **1.5 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste volatile materials mineral spirits oil paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
  - .1 Number and size of bins.
  - .2 Waste type of each bin.
  - .3 Total tonnage generated.
  - .4 Tonnage reused or recycled.
  - .5 Reused or recycled waste destination.
- .4 Remove materials on-site as Work progresses.

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 APPLICATION**

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

**3.2 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                INSPECTION AND DECLARATION**

- .1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
  - .1 Notify Site Supervisor in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
  - .2 Request Site Supervisor's inspection.
- .2 Site Supervisor's Inspection: Site Supervisor and Contractor to inspect Work and identify defects and deficiencies. Contractor to correct Work as directed.
- .3 Completion Tasks: submit written certificates that following tasks have been performed:
  - .1 Work: completed and inspected for compliance with Contract Documents.
  - .2 Defects: corrected and deficiencies completed.
  - .3 Work: complete and ready for final inspection.
- .4 Inspection or statement of final completion: When items noted are completed, request final inspection of Work by Site Supervisor and Contractor. When Work incomplete according to Site Supervisor, complete outstanding items and request re-inspection.

**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                ACTION AND INFORMATION SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Provide evidence, if requested, for type, source and quality of products supplied.

**1.2                AS-BUILT DOCUMENTS AND SAMPLES**

- .1    Maintain, at site for Site Supervisor one record copy of:
  - .1    Contract Drawings.
  - .2    Specifications.
  - .3    Addenda.
  - .4    Change Orders and other modifications to Contract.
  - .5    Reviewed shop drawings, product data, and samples.
  - .6    Inspection certificates.
  - .7    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 Site Supervisor.

**1.3                RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1    Record information on set of opaque drawings, provided by Site Supervisor.
- .2    Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3    Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4    Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1    Measured depths buried elements.
  - .2    Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3    Field changes of dimension and detail.
  - .4    Changes made by change orders.
  - .5    Details not on original Contract Drawings.

- .6 References to related shop drawings and modifications.
- .5 Specifications: 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: maintain manufacturer's certifications, inspection certifications, required by individual specifications sections.
- .7 Provide digital photos for site records, and namely with respect to the marking of existing stones.
- .8 At work completion, submit original copy of all construction documents to Site Supervisor, annotated as specified.

**1.4 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Site Supervisor approval.
- .3 Warranty management plan to include required actions and documents to assure that Site Supervisor 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 Submit, warranty information made available during construction phase, to Site Supervisor for approval prior to each monthly pay estimate.
- .6 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

**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                RELATED REQUIREMENTS**

- .1        Section 03 20 00 - CONCRETE REINFORCING
- .2        Section 03 30 00 - CAST-IN-PLACE CONCRETE

**1.2                REFERENCES**

- .1        Refer to the latest applicable editions of the following standards:
  - .1        Canadian Standards Association (CSA International)
  - .2        CSA-A23.1, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .3        CAN/CSA-S269.3, Concrete Formwork, National Standard of Canada
- .2        Ministère des Transports du Québec (MTQ)
  - .1        *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (CCDG)*
  - .2        Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3101, *Béton de masses volumiques normales.*
  - .3        Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3501, *Matériaux de cure.*
  - .4        Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3801, *Mortiers cimentaires en sac.*
  - .5        Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3901, *Coulis cimentaires.*

**1.3                DELIVERY, STORAGE AND HANDLING**

- .1        Waste Management and Disposal:
  - .1        Separate waste materials and disposal.
  - .2        Place materials defined as hazardous or toxic in designated containers.
  - .3        Divert wood materials from landfill to a recycling facility.
  - .4        Divert unused plastic materials from landfill to a recycling facility.
  - .5        Divert unused form release material from landfill to an official hazardous material collection site.

**Part 2            Products**

**2.1                MATERIALS**

- .1        Formwork materials:

- .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.
- .2 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.
- .3 Form release agent: non-toxic, biodegradable, low VOC.
- .4 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm<sup>2</sup>/s at 40 °C, flashpoint minimum 150 °C, open cup.
- .5 Falsework materials: to 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 Site Supervisor'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 CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 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.
- .8 Align form joints and make watertight. Keep form joints to minimum.
- .9 Incorporate anchors and other inserts required in specified Work.
- .10 Clean formwork in accordance with CSA standard A23.1/A23.2, before placing concrete.

#### **3.2 REMOVAL AND RESHORING**

- .1 After pouring the concrete, leave the formwork in place for at least the minimum period as indicated by the CCDG, article 15.4.3.1.6.
- .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 The formwork shall be considered removed once it has been loosened and a part of it is no longer in contact with the concrete.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 03 10 00 – CONCRETE FORMING AND ACCESSORIES
- .2        Section 03 30 00 - CAST-IN-PLACE CONCRETE

**1.2                REFERENCES**

- .1        Refer to latest applicable editions of following standards:
  - .1        American Concrete Institute (ACI)
    - .1        SP-66, ACI Detailing Manual 2004.
  - .2        ASTM International
    - .1        ASTM A82/A82M, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
    - .2        ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
    - .3        ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
    - .4        ASTM A775/A775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
    - .5        ASTM A641, Standard Specification for zinc-coated (galvanized) carbon steel wire”.
  - .3        CSA International
    - .1        CSA-A23.1-04/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    - .2        CAN/CSA-A23.3, Design of Concrete Structures, latest edition.
    - .3        CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement, latest edition.
    - .4        CSA-G40.20-13/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, latest edition.
    - .5        CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles Metals and Metal Products, latest edition.
    - .6        CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction, latest edition.
  - .4        Reinforcing Steel Institute of Canada (RSIC)
    - .1        RSIC, Reinforcing Steel Manual of Standard Practice.
  - .5        Ministère des Transports du Québec (MTQ)
    - .1        Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (CCDG).

- .2 Ouvrages routiers, Normes, Tome VII – Matériaux, norme 5101, Armatures pour les ouvrages de béton.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .2 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .3 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.
- .4 Welded steel wire fabric: to ASTM A185/A185M. Provide in flat sheets only.
- .5 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164 and to ASTM A641.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and with the *Reinforcing Steel Manual of Standard Practice* by the Reinforcing Steel Institute of Canada (RSIC).
- .2 Obtain Consultant's written approval for locations of reinforcement splices other than those shown on placing drawings.

## **Part 3 Execution**

### **3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by the Site Supervisor.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

### **3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.

- .2 Prior to placing concrete, obtain The Site Supervisor's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

**3.3 CLEANING**

- .1 Progress Cleaning: Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for recycling.

**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                REFERENCES**

- .1        Abbreviations and Acronyms:
  - .1        Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
    - .1        Type GU, GUb and GUL - General use cement.
  - .2        Fly ash:
    - .1        Type F - with CaO content less than 15%.
  - .3        Type S: granulated blast furnace slag.
- .2        Reference Standards:
  - .1        Refer to the latest applicable editions of the following standards:
    - .1        CSA International
      - .1        CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
      - .2        CSA A283, Qualification Code for Concrete Testing Laboratories.
      - .3        CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

**1.3                QUALITY ASSURANCE OF CONCRETE**

- .1        Parks Canada will assign quality control of concrete to a laboratory specializing in this type of work and pay for all inspections and testing.
- .2        The Laboratory is the Departmental Representative's agent for all matters pertaining to concrete proportioning and placing. In this capacity, the laboratory is authorized to issue directives which the Contractor and concrete supplier are required to conform.
- .3        Submit the following to the Laboratory's approval:
  - .1        Samples of coarse and fine aggregates
  - .2        Concrete mix proportioning
  - .3        The type and make of admixtures
  - .4        The analyses of the alkali aggregate reactivity.
- .4        Provide laboratory minimum 24h notice prior to placing of concrete specifying date and time of every pour.

## 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
  - .1 Do not modify maximum time limit without receipt of prior written agreement from the Site Supervisor and concrete producer as described in CSA A23.1/A23.2.
  - .2 Deviations to be submitted for review by the Site Supervisor.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Packaging Waste Management: remove for reuse/recycling.

## Part 2 Products

### 2.1 MATERIALS

- .1 Portland Cement: to CSA A3001, Type GU.
- .2 Water: to CSA A23.1.
- .3 Aggregates: to CSA A23.1/A23.2.
- .4 Curing product: to CSA A23.1/A23.2 .

### 2.2 MIXES

Description	Masse min liant (kg/m <sup>3</sup> )	Compressive strength at 28 days (MPa)	Max. Water/Cement Ratio <sup>(1)(2)</sup>	Coarse aggregates (mm)	Air content <sup>(3)</sup> (%)	Slump <sup>(4)(5)</sup> (mm) ±20
Arch foundation repair	340	35	0,45	5-20	5-8	80
	450	35	0,42	2,5-10	6-9	200
Lean concrete	220	15	0,75	5-20	5-8	80

- (1) Ternary cement, type GUB-S/SF or GUB-F/SF. The total mass of supplementary cementing materials (fly ash, silica fume and slag) shall not exceed 30% of the total weight of the binder.
- (2) Where silica fume is used, the water/cement ratio becomes the water/(cement + silica fume) ratio.
- (3) Air content is always the same, whether a superplasticizer is added or not.
- (4) Tolerances in specified slump values slump apply only for control.
- (5) When pumping is used to place concrete, slump without the addition of superplasticizer may be increased by 20 mm. However, the water/cement ratio must be maintained.

### 2.3 READY-MIX SUPPLIER

- .1 The ready-mix supplier shall be responsible for the mix of this concrete and shall control at own cost the quality and uniformity of his products.
- .2 Selection of the concrete supplier is subject to acceptance by the Site Supervisor.



**Part 3 Execution**

**3.1 PREPARATION**

- .1 Obtain Site Supervisor's written approval before placing concrete. Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 Prior to placing of concrete obtain Site Supervisor's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application for concrete finishes.

**3.2 CONCRETE MAKING AND DELIVERY**

- .1 Prepare and mix concrete at ready-mix plant and deliver to the work site in mixers that comply with the requirements of CSA-A23.1.
- .2 Take appropriate steps to ensure that concrete poured is carried out within ambient air temperature limits stated in Table 16 of CSA-A23.1.
- .3 Organise and schedule concrete deliveries to ensure that each concreting operation is conducted without interruption
- .4 Where superplasticizer is required to improve concreting, proceed to addition of superplasticizer on site after all other ingredients are thoroughly mixed. Add superplasticizer in such way that the properties of concrete are maintained during unloading, placement and consolidation. Comply with the requirements and methods recommended by the manufacturer. Proportion the superplasticizer to obtain concrete slump between 100 mm and 150 mm.
- .5 Do not add water to concrete before unloading the mixer without prior authorisation by Site Supervisor. Water quantities added to concrete shall be indicated on the delivery slip.

**3.3 PLACING**

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Where placement operations involve dropping the concrete more than 1.5 m in formwork, place vertically using a suitable tubular conduit.

**3.4 CURE AND PROTECTION**

- .1 When the concrete has set sufficiently, the exposed surfaces shall be kept wet continually for at least seven (7) consecutive days after placing. The water used for curing shall be clean and free of any material likely to stain or discolor the concrete.
- .2 During exceptional weather conditions such as when temperature is hot, winds high and relative humidity low, take special measures throughout concrete hardening period. Wall and column formwork shall then be kept thoroughly damp.

- .3 Freshly placed concrete shall be protected against direct sunlight, dry winds, frost, excessive heat and running water using adequate tarps or other membrane or sheeting to cover or fully enclose all freshly finished surfaces during entire concrete hardening period.

### 3.5 COLD WEATHER CONCRETING

- .1 Where ambient temperature is 5 oC or lower, or when it is likely that temperature will drop below this limit during placement or hardening, the requirements of this subsection concerning cold weather concreting shall apply.
- .2 Where concrete must be placed in cold weather conditions, all that is necessary to execute the work must be readily available. The tools and materials at hand shall maintain the required temperatures during concrete placement and hardening. Heating systems shall not be detrimental to concrete quality or adversely affect in any way the finishing materials. Heating devices that release carbon monoxide shall not be permitted.
- .3 Concrete shall not be laid on or against formwork, on grade or on any surface displaying a temperature lower than 5 oC.
- .4 The temperature of fresh concrete at time of placement shall read between 15 oC and 30 oC. Where the ambient temperature is relatively low, concrete temperature should come close to the 30 oC upper limit.
- .5 Implement efficient measures to maintain all concrete surfaces at 20 oC minimum during three (3) days or at 10 oC minimum during five (5) days after placement. Where dry heat is used, moisten the air in the enclosure and maintain both concrete and formwork continuously moist.
- .6 Concrete shall be kept at a temperature above freezing for a 7-day period; avoid alternating freeze-thaw cycles for a minimum of fourteen (14) days after concrete placement.
- .7 Protection methods:
  - .1 The above protection specifications may be complemented using adequate insulation and covering concrete surfaces with raised tarps (sheeting in contact with the concrete is absolutely counter-productive) or by fully enclosing the concrete and providing an opening for the introduction of heat in the enclosure as needed.
  - .2 Note: Adequate protection depends on outside temperature, wind velocity and massivity of concrete.
  - .3 Where the outside temperature is likely to drop below -12 oC during placement or during the above mentioned protection period, fully enclose the concrete structure and provide supplementary heating source.
  - .4 Where the ambient temperature is likely to drop below -4 oC but not lower than -12 °C during placement or during the above mentioned protection period, cover all concrete surfaces using adequate raised tarps or insulating blankets in addition to supplementary heating source.

- .5 Where the ambient temperature is likely to drop to  $-4^{\circ}\text{C}$  during placement or during the above mentioned protection period, cover all concrete surfaces using adequate raised tarps or insulating blankets and supplementary heating should be available.
- .6 At the end of the specified protection period, withdraw protection and heating gradually such that air temperature around concrete does not drop by more than  $10^{\circ}\text{C}$  per day until ambient temperature is reached.
- .7 Do not use salt or other so-called chemical freezing-point reducers unless written authorisation is obtained from the Site Supervisor.

### **3.6 CLEANING**

- .1 Proceed to cleaning at work completion..
- .2 Waste Management: separate waste materials for recycling.
  - .1 Divert unused concrete materials from landfill to local quarry facility after receipt of written approval from the Site Supervisor.
  - .2 Provide appropriate area on job site where concrete trucks and be safely washed.
  - .3 Remove and dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

**END OF SECTION**

Approved: 2014-06-30

**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Provide proposed cleaning method and type of protection from cleaning residue for in-place conditions.

**1.2                QUALITY ASSURANCE**

- .1        Regulatory Requirements: ensure work is performed in compliance with applicable Provincial regulations.
- .2        Mock-ups:
  - .1        Notify Site Supervisor 48 hours before commencing cleaning of each test patch. Obtain approval from Site supervisor before commencing test.
  - .2        Conduct tests to determine effectiveness of following parameters for cleaning of masonry: water pressure and temperature, nozzle types and spraying distances.
  - .3        Start with lowest impact tests and stop testing when desired level of cleaning is achieved. Stop testing immediately when damage occurs.
  - .4        Test brushing and spraying as an alternative to pressure washing. Submit test outcomes to Site Supervisor for review. Use method approved by Site Supervisor.

**1.3                AMBIENT CONDITIONS**

- .1        Do not use wet cleaning methods when there is threat of frost.

**Part 2            Products**

**2.1                MATERIALS**

- .1        Use clean potable water free from contaminants.
- .2        Treat water which has high metal content before use in cleaning.
- .3        Use clean air, free of oil or other contaminants.

**2.2                HOT WATER**

- .1        Use water at 20°C.
- .2        Generate hot water in flash boiler or other suitable appliance.

**2.3                TOOLS AND EQUIPMENT**

- .1        Use only brushes with natural or soft plastic bristles.
- .2        Use only scrapers of wood or plastic.

- .3 Use water pumps fitted with accurate pressure regulators and gauges capable of being preset and locked at maximum specified levels. Water pumps to have rating of less than 150 kPa.
- .4 Use air compressors equipped with on-line oil filters to avoid spraying oil onto masonry.
- .5 Use gun equipped with pressure gauge at nozzle end.
- .6 Use plastic or non-ferrous metal piping and fittings.

### **Part 3 Execution**

#### **3.1 SITE VERIFICATION OF CONDITIONS**

- .1 Record existing conditions with photographs before and after cleaning. Notify Site Supervisor of potential complications with existing conditions.
- .2 Report to Site Supervisor conditions of deteriorated masonry or pointing not noted on Contract Drawings found before and during cleaning.
- .3 Obtain written approval of Site Supervisor before cleaning areas of deteriorated masonry.

#### **3.2 PREPARATION**

- .1 Protect operatives and other site personnel from hazards.
  - .1 Ensure good ventilation in work area.
  - .2 Ensure workers wear eye, head, face protection, protective gloves, coveralls, boots and respirator to relevant MSHA/NIOSH standards.

#### **3.3 PROTECTION OF IN-PLACE CONDITIONS**

- .1 Cover and protect surfaces and non-masonry finishes not to be cleaned.
- .2 Protect wood, glass, and metal adjacent to masonry.
- .3 Protect plants, gardens, shrubs from watering and chemicals.

#### **3.4 EXECUTION OF CLEANING**

- .1 Proceed with cleaning in accordance with written instructions of methods, systems, tools and equipment approved by Site Supervisor.
- .2 Dry brush or scrape surface deposits on walls.
- .3 Pre-wet masonry surface when necessary. Work from bottom of wall upwards.
- .4 Do not exceed maximum pressure at nozzle or have nozzle closer to masonry than approved by Site Supervisor during tests.
- .5 Stop work when cleaning has detrimental effect on surrounding material and plants.
- .6 Soften and loosen heavy dirt and calcite deposit with extended water spraying, than brush stained surfaces. Remove thick deposits with wooden scrapers.
- .7 Removal of vegetation or organic growth growing in or on masonry.

- .1 Soak masonry with low-pressure water.
- .2 Follow soaking by gentle scrubbing with natural bristle brushes.
- .8 Low-Pressure Water Soaking:
  - .1 Remove stains accumulated dirt with low-pressure maximum 350 kPa wash-down at flow rate of 0.25 L/s. Hold nozzle minimum 450 mm from masonry surface.
  - .2 Used a fan-type nozzle with minimum 375 mm spread.
  - .3 Hold nozzle minimum 450 mm from masonry surface.

### **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 Rinse off masonry to satisfaction of Site Supervisor.
- .3 Rinse from bottom to top and from top to bottom.
- .4 Clean up work area as work progresses. At end of each work day remove debris and waste from site.
- .5 Upon completion, clean and restore areas used for work to condition equal to that previously existing.

### **3.6 PROTECTION OF WORK**

- .1 Protect finished Work from damage until take-over.

**END OF SECTION**

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Approved: 2014-06-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 04 03 08 – Historic – Mortaring.

**1.2                REFERENCES**

- .1            Definitions:
  - .1            Raking: removal of loose/deteriorated mortar to a depth suitable for repointing until sound mortar, and/or at least 25 mm and/or not more than 100 mm depth is reached.
  - .2            Repointing: filling and finishing of masonry joints from which mortar is missing, has been raked out or has been omitted.
  - .3            Tooling: finishing of masonry joints using tool to provide final contour.
  - .4            Low-pressure water cleaning: water soaking of masonry using less than 350 kPa (50 psi) water pressure, measured at nozzle tip of hose.
- .2            Reference Standards:
  - .1            CSA Group
    - .1            CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
    - .2            CAN/CSA-A179-04(R2014), Mortar and Grout for Unit Masonry.

**1.3                QUALITY ASSURANCE**

- .1            Masonry Contractor:
  - .1            Call upon only one Masonry Contractor for masonry work at and.
  - .2            Masonry Contractor will to be capable of demonstrating his skills and will present three (3) realizations in historic stone masonry work on project of similar size and complexity to Work of this contract during the last 10 years.
  - .3            Masonry Contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing stonework which are part of structural masonry work.
- .2            Masons:
  - .1            Masons to have certificate of qualification with five (5) years minimum experience in historic stone masonry work.
  - .2            Masons to have proof of license certification for proprietary restoration mortars.
- .3            Mock-ups:
  - .1            Construct two (2) work samples 1,5 m x 1,5 m where indicated by the Site Supervisor to demonstrate raking and repointing procedures.

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- .2 Provide Site Supervisor with at least 24 hours notice prior to construction of the mock-ups.
  - .3 Allow 24 hours for inspection of mock-up by Site Supervisor before proceeding with masonry repointing work.
  - .4 Accepted mock-up will demonstrate minimum standard for this work. Mock-up will remain as part of finished work.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Keep material dry. Protect from weather, freezing and contamination.
- .3 Ensure that manufacturer's labels and seals are intact upon delivery.
- .4 Remove rejected or contaminated material from site.

#### **1.5 AMBIENT CONDITIONS**

- .1 Maintain masonry temperature between 10 and 25 °C for duration of work.
- .2 Ambient temperature lower than 10°C: Store mortaring materials for immediate use within heated enclosure in accordance with section 04 03 08 – Historic – Mortaring and allow them to reach minimum temperature of 10 °C before use.
- .3 Only water can be heated before use. Provide hot water to a maximum 40 °C on site during cold weather.
- .4 Maintain mortar mix temperature between 5 and 40 °C.

### **Part 2 Products**

#### **2.1 MORTAR**

- .1 Mortar: in accordance with CAN/CSA-A179 and Section 04 03 08 - Historic - Mortaring.

### **Part 3 Execution**

#### **3.1 RAKING JOINTS**

- .1 Use manual raking tool to remove deteriorated and bonded mortar from masonry units. The use of saws is strictly prohibited.
  - .1 Remove deteriorated and adhered mortar from masonry surfaces to sound mortar maximum depth of 100 mm, leaving square corners and flat surface at back of cut.
  - .2 Clean out voids and cavities encountered.
- .2 Ensure that no stones and other masonry units are chipped, altered or damaged by work to remove mortar in joints.



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- .3 Clean surfaces of joints by compressed air or water under low pressure without damaging texture of exposed joints or masonry units.
  - .4 Flush open joints and voids; clean open joints and voids with low pressure water and if not free draining blow clean with compressed air.
  - .5 Leave no standing water.

### **3.2 REPOINTING**

- .1 Dampen joints as well as masonry units.
- .2 Keep masonry damp while pointing is being performed.
- .3 Completely fill joint with mortar. Use type "N" mortar.
  - .1 If surface of masonry units has worn rounded edges keep pointing back from surface to keep same width of joint
  - .2 Avoid feathered edges.
  - .3 Pack mortar firmly into voids and joints.
- .4 Build-up pointing in layers not exceeding 25 mm in depth.
  - .1 Allow each layer to set before applying subsequent layers.
  - .2 Maintain joint width to full depth.
- .5 Tool and finish joints to match existing joints or as directed by Site Supervisor.
- .6 Remove excess mortar from masonry face before it sets.

### **3.3 PROTECTION DURING CURING PROCESS**

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day. Membranes be tightly installed to prevent finished work from drying out too rapidly.
- .2 Cover with waterproof tarps to prevent weather from eroding recently repointed material.
  - .1 Maintain tarps in place for minimum of 2 weeks after repointing.
  - .2 Ensure that bottoms of tarps permit airflow.
- .3 Anchor coverings securely in position.
- .4 Damp cure:
  - .1 Provide damp cure for pointing mortars.
  - .2 Install and maintain wetted burlap protection during the curing process and over minimum three (3) days.
  - .3 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
  - .4 Shade areas of work from direct sunlight and maintain constant dampness of burlap.
- .5 Protect from drying winds. Pay particular attention at corners of structure.
- .6 Maintain ambient temperature of minimum 10 °C after repointing masonry for:

- .1 Minimum 3 days in summer.
- .2 Minimum 30 days in cold weather conditions using dry heated enclosures.

**3.4 CLEANING**

- .1 Clean surfaces thoroughly of mortar droppings, stains and other blemishes resulting from work of this contract on a daily basis, as work progresses.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Do further cleaning using stiff natural bristle brushes after mortar has attained its initial set and has not fully cured.
- .4 Clean masonry with stiff natural bristle brushes and plain water and soft natural bristle brush
- .5 Clean masonry with low pressure 15 to 45 lb/po<sup>2</sup> clean water and soft natural bristle brush.

**3.5 PROTECTION OF COMPLETED WORK**

- .1 Protect adjacent finished work against damage which may be caused by on-going work.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 04 03 07 – Historic – Masonry repointing.
- .2        Section 04 03 09 – Historic – Grouting.
- .3        Section 04 03 42 – Historic – Replacing of stone.
- .4        Section 04 05 00 – Common work results for masonry

**1.2                ALTERNATES**

- .1        Obtain Site Supervisor's approval before changing manufacturer's brands or sources of supply of mortar materials during entire contract or other methods of mixing mortar specified elsewhere in this specification.

**1.3                REFERENCES**

- .1        CSA International
  - .1        CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.

**1.4                TECHNICAL DATA SHEET**

- .1        Submit technical data sheets of products used at least fifteen (15) days prior to commencing work.

**1.5                TESTING STANDARDS**

- .1        Flow and cube strength: to ASMT C 270.
- .2        Vicat cone test: to ASTM C780.
- .3        Cube strength: to CAN/CSA-A179, annexe B.
- .4        Flexural bond strength: to ASTM C1072.

**1.6                AMBIENT CONDITIONS**

- .1        Execute work when ambient temperature is above 10 °C. When ambient temperature is below 10 °C, cover and heat work as directed by Site Supervisor.
- .2        Prepare and maintain temperature of mortar between 5 and 40 °C until used.
- .3        Maintain the temperature of receiving surface and mortar between 10 and 25 °C for 72 hours after application in summer and for 30 days in winter.

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**Part 2 Products**

**2.1 MORTAR**

- .1 Type N joint and bedding mortar: based on proportion specifications, consisting of 1 part off white Portland cement, 1 part lime, and 6 parts sand.
- .2 Type S joint and bedding mortar: based on proportion specifications, consisting of 2 parts grey Portland cement, one (1) part lime, and nine (9) parts sand.
- .3 Type O joint and bedding mortar: based on proportion specifications, consisting of 1 part off white Portland cement, two (2) parts lime, and nine (9) parts sand.
- .4 Repointing mortar for coping stones: use gray polyurethane flexible mortar containing sand.
- .5 All dry mortar materials shall be premixed at the plant, bagged and originate from one (1) only manufacturer.

**2.2 COMPRESSIF STRENGTH**

- .1 Compressive strength measured on collected samples shall comply with the following:
  - .1 Type N mortar:
    - .1 compressive strength 2 MPa at 7 days
    - .2 compressive strength 3,5 MPa at 28 days
  - .2 Type S mortar:
    - .1 compressive strength 5 MPa at 7 days
    - .2 compressive strength 8,5 MPa at 28 days
  - .3 Type O mortar:
    - .1 compressive strength 2,5 MPa at 28 days.

**2.3 AIR CONTENT**

- .1 Type N mortar: 18 % maximum.
- .2 Type S mortar: 18 % maximum.
- .3 Type O mortar: 14 % maximum.

**Part 3 Execution**

**3.1 LIME MORTAR BATCHING**

- .1 Mix mortar in a clean mortar mixer. Use potable water in quantities recommended by the manufacturer and mix as indicated.

**3.2 POLYURETHANE MORTAR BATCHING**

- .1 Mix mortar components to manufacturer's recommendations.

**3.3 CLEANING**

- .1 Remove droppings and splashings using clean sponge and water.
- .2 Clean masonry with low pressure 15 to 45 psi clean water and soft natural bristle brush.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 04 03 07 – Historic – Masonry repointing
- .2        Section 04 03 08 – Historic – Mortaring.
- .3        Section 04 03 42 – Historic – Replacing stone.

**1.2                REFERENCES**

- .1        Definitions:
  - .1        Grout: cementitious or epoxy mixture of liquid consistency suitable for pouring or pumping, to fill voids between masonry elements.
- .2        Reference Standards:
  - .1        CSA Group
    - .1        CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
    - .2        CAN/CSA-A179, Mortar and Grout for Unit Masonry.
    - .3        CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Work method:
  - .1        Submit a document describing method of wall's grout injection, including the position of injection pipes, equipment required and the sequence of works.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2        Keep material dry. Protect from weather, freezing and all forms of contamination.

**1.5                AMBIENT CONDITIONS**

- .1        Maintain temperature of masonry elements to be grouted above 5 °C throughout their thickness, during and 48 hours after grouting.

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**Part 2 Products**

**2.1 MATERIALS**

- .1 Pre-packaged : « GROUT VM » AMBEX (30 Kg).
- .2 Water : clean and free from contaminants and organic material in accordance to CSA A23.1/A23.2. Almost 4,2 litre / (30 Kg de VM) .
- .3 Plasticizer : PS 1466. Almost 75 ml / (30Kg de VM).
- .4 Viscosity-Modifying admixture: Rheomac VMA 362.
- .5 Spread between 500 and 700 mm.
- .6 V Funnel : 2 to 4 secondes.
- .7 Compression strength after 48 hours: 30 MPa.
- .8 The amount of water, plasticizer and viscosity admixture should be calibrated during convenience test to obtain the properties requested (.5, .6 and .7).

**2.2 EQUIPMENT**

- .1 Mechanical mixer: size compatible with volume of mortar grout prepared.
- .2 Mechanical regulator to prevent segregation of ingredients after mixing and ensure injection continuity.
- .3 Maintain mixing equipment in good working order. Ensure that necessary spare parts are available on site.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grout installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Site Supervisor.
  - .2 Report to Site Supervisor before start of work possible structural masonry problems and conditions that do not conform to those specified including existing voids or possible openings which risk being compromised when grout will flow.
  - .3 Inform Site Supervisor of unacceptable conditions immediately upon discovery.
  - .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Site Supervisor.

**3.2 INSPECTION**

- .1 Mixing operations: continuously inspected by Site Supervisor.
- .2 Provide required assistance to facilitate taking of grout samples and inspection work.
- .3 Inspect surfaces of structure before commencing injection work.

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### 3.3 CONDITION OF SURFACES

- .1 Evaluate moisture content of masonry work by taping 3 x 3 m polyethylene sheet to masonry surface. If moisture collects on underside of sheet before epoxy would cure, allow masonry work to dry sufficiently before commencing injection work.

### 3.4 MEASUREMENT AND MIXING

- .1 Make volume measurement using suitably gauged hopper of size compatible with volume of grout prepared.
- .2 Keep volume measures clean and free from crusting.
- .3 Periodically check the shovel count against gauge box.
- .4 Use manufacturer's mass density information in making mass measurement to proportion mortar grout.
- .5 Mix cementitious materials, admixtures [aggregates] in mechanical mixer for period of not less than 5 minutes nor more than 10 minutes with specified amount of water.
- .6 Use grout before it has begun to set but not more than [\_\_\_\_\_] minutes after initial mixing.

### 3.5 FIELD LOG

- .1 Maintain log of grouting work. Containing collection of information, including:
  - .1 Course of pumping data including calibration of equipment used.
  - .2 Grout components (products, additions, admixtures and water) and quantity pumped.
  - .3 Pumping mode.
  - .4 Injection site.
  - .5 Pumping pressure at injection sites.
  - .6 Readings of pressure and flow injection taken, either by data loggers or manually.
  - .7 Equipment used.
  - .8 Staff on site.
  - .9 Drilling Plan.

### 3.6 PREPARATION

- .1 Ensure that all repointing work is done before starting grouting works.
- .2 Wet surfaces, deep into substrate.

### 3.7 INSTALLATION

- .1 Insert injection tubes with a regular spacing during repointing works in according to the method presented to Site Supervisor for approval at least 10 days prior the commencement of work.
- .2 Start the grout injection at the bottom.



- .3 Seal leaks with quick-setting cement.

**3.8 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 04 03 08 – Historic – Mortaring.
- .2     Section 04 03 43 – Historic – Dismantling stone masonry
- .3     Section 04 05 00 – Common work results for masonry.

**1.2                REFERENCES**

- .1     ASTM International
  - .1     ASTM C97/C97M, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
  - .2     ASTM C170/C170M, Standard Test Method for Compressive Strength of Dimension Stone.
  - .3     ASTM C568/C568M, Standard Specification for Limestone Dimension Stone.
  - .4     ASTM C616/C616M, Standard Specification for Quartz-Based Dimension Stone.
- .2     CSA Group
  - .1     CAN/CSA-A179, Mortar and Grout for Unit Masonry.
  - .2     CSA A370, Connectors for Masonry.
  - .3     CAN/CSA-A371, Masonry Construction for Buildings.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1     Shop Drawings:
  - .1     Submit drawings describing method of stone replacement, including removal, shoring and erection.
  - .2     Submit drawings stamped and signed by professional engineer with experience in rehabilitating historic structures registered or licensed in Quebec.
  - .3     Keep in mind that no technical document in DWG format will be provides to contractor and/or subcontractor.
    - .2     Drawings of stone cutting:
      - .1     Submit a drawing for each type of stone being replaced showing dimensions, type finish on exposed and unexposed faces, bedding planes, location of anchors and other details.
      - .2     Submit drawings along with samples.
    - .3     Samples:
      - .1     Submit samples of replacement stones not less than fifteen (15) days before masonry work begins.
        - .1     Submit two (2) of each type of masonry unit specified: facing stone, coping stone.

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- .2 Submit 1 of each type of masonry reinforcement and tie proposed for use.
  - .3 Submit the following stone samples:
    - .1 Veneer stone: 300 mm x 300 mm x 300 mm.
    - .2 Coping stone: 200 mm x 300 mm x 300 mm (including the rounded part).
  - .4 Choose samples from the currently mined bed in the quarry and provide a certificate issued by the quarry.

#### **1.4 QUALITY ASSURANCE**

- .1 Allow Site Supervisor access to mason's workshop for inspection of current work-in-progress.
- .2 Qualifications:
  - .1 Masonry contractor will have to be capable of demonstrating his skills and will present three (3) realizations in historic stone masonry work on projects of similar size and complexity to Work of this Contract during the last 10 years.
  - .2 Execute work of this section by personnel experienced in preservation of historic masonry.
  - .3 Masons engaged by Masonry Contractor to have minimum of five (5) years' experience with historic masonry.
  - .4 Site Supervisor has right to reject masons who do not demonstrate appropriate abilities or experience.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials to avoid altering or staining their finish.
- .2 Keep materials dry. Protect against weather, freezing and any source of contamination.
- .3 Do not place stones directly on the ground.

#### **1.6 LIST OF STONE**

- .1 Make a list of each of the stones to be replaced, indicating their accurate dimensions, their location in the structure and a reference to the stone cutting drawings submitted.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Existing stone:
  - .1 The existing stone came from a quarry on "L'Île Lamothe" in United-States.
  - .2 Stone to be provided by contractor:
    - .1 Obtain new stone from a single stone quarry acceptable to Site Supervisor.
    - .2 New Cut stone from the following source or equivalent new stone from another source proposed by contractor and approved by Site Supervisor:
      - .1 Cut stone from « Des Carrières Ducharme inc. », Havelock, (Quebec).

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## **2.2 STONE PROPERTIES**

- .1 General description
- .1 Stone should come from uniform and compact structural layers. Extraction bed thickness must allow saw cutting and straightening of exposed faces (bush hammering and combing).
- .2 Stone should come from deep layers and not surface layers; the color should be from grey to dark grey and should be harmonized with existing stone color; they shall not contain quartz and other impurities.
- .2 Technical description :
  - .1 Geological age: Chazy's formation.
  - .2 Chemical classification : first quality magnesian type with less than 20% impurities.
  - .3 Mechanical resistance :
    - .1 Compressive strength : 35 Mpa in perpendicular direction to natural bed stone.
    - .2 Absorption : 0,08%
- .4 Stone supply should respect approved schedule.

## **2.3 STONE BEDDING PLANES**

- .1 All types of stone with horizontal bedding plane.

## **2.4 STONE FABRICATION**

- .1 Stones to be perfectly squared to shape and dimensions to existing dimensions.
- .1 Dress exposed faces true. Finish exposed faces of stones to match finish of existing stones.
- .2 The five (5) unexposed faces of the stones shall be roughened after sawing and display perfectly rough surfaces offering good adherence with mortar to full depth of stones. No sawed surface will be accepted.
  - .2 Execute profiled work from full size details and templates. Make exposed arises in true alignment and ease slightly to prevent snipping.
  - .3 Execute profiled work from full size details and templates.
- .1 Make exposed arises in true alignment and ease slightly to prevent snipping.
- .4 Drill stones in stone to fit lifting hooks.
- .1 Provide Lewis pin and clamp holes in pieces which cannot be manually lifted.
- .2 Do not cut holes in exposed surfaces and at least than 150 mm from a rise.
  - .5 Finish exposed faces and edges of stones to comply with requirements indicated for finish and match approved samples and field-constructed mock-up.

## **2.5 FABRICATION TOLERANCES**

- .1 Fabricate limestone dimension stone to the following tolerances:
  - .1 Unit Length: plus or minus 3 mm.
  - .2 Unit Height: plus or minus 3 mm.

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- .3 Deviation From Square: plus or minus 3 mm, with measurement taken using the longest edge as the base.

## **2.6 EXISTING STONE**

- .1 Use hard, sound, and clean existing stone salvaged on site as approved by Site supervisor to replace stones of smaller dimensions. Sawed faces shall be roughened as indicated above.

## **2.7 REJECTS**

- .1 Stone from blasted quarry bed will be refused.
- .2 Stone from naturally fractured beds will be refused.
- .3 After cutting and dressing, stone units shall display none of the following imperfections:
- .1 Chipping and pick marks;
- .2 Crack, fracture and traces of stone splitting;
- .4 The Contractor shall control the quality of the stones delivered to the construction site and the Site Supervisor reserves the right to reject stones that do not meet the quality criteria set out for this project.

## **2.8 MORTAR**

- .1 Mortar: in accordance with Section 04 03 08 - Historic - Mortaring.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Move and lift stone units using means to prevent damage. Submit stone units dropped or impacted to Site Supervisor for inspection and approval.
- .2 Indicate bedding planes of stone units. Duplicate bedding marks on usable pieces of cut stone.

### **3.2 STONE REMOVAL**

- .1 Stone removal in accordance with Section 04 03 43 - Historic - Dismantling Stone Masonry.
- .2 Remove dust, loose fragment and mortar from slot.

### **3.3 RAKING JOINTS**

- .1 Rake joints around stones to be removed in accordance with section 04 03 07 (Historic - Masonry Repointing).

### **3.4 MOVING STONES**

- .1 Use Lewises or dogs to lift stones to working level.
- .2 Slide stones into place on wood ramps.

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- .3 Protect edges of stone from damage when hoisting and lifting from position. Use separators or wood shims to isolate units from hoisting belts. Incorporate only undamaged stone in Work.

### **3.5 STONE REPLACEMENT**

- .1 Install masonry ties, connectors and flashings in accordance with CSA A370 and CAN/CSA-A371 unless indicated otherwise. Prior to placing mortar, obtain approval of Site supervisor of placement of ties and connectors.
  - .2 Co-ordinate bond pattern, coursing height and joint width with existing masonry work.
  - .3 Clean dust and stone fragments from slot where new veneer stone will be inserted. Before proceeding with Work, inspect cleaned surface with Site Supervisor.
  - .4 Dampen stone slot's surfaces before applying mortar.
  - .5 Apply bedding mortar.
- .1 Lay stones on full beds of mortar.
  - .2 Fill vertical joints buttered and placed full in face, and at vertical joint between wythes.
  - .3 Lay stones and tool joints in one operation, tooling with a round jointer to provide smooth joints compressed uniformly concave.
  - .4 Rake bedding mortar back to a minimum depth of 25 mm and make ready for pointing with pointing mortar. Provide minimum 3-day damp cure to bedding mortar prior to pointing.
  - .6 Lay heavy stones and projecting stones after mortar in courses below has hardened sufficiently to support weight.
  - .7 Prop and anchor projecting stones until wall above is set.
  - .8 Set stones to match alignment of adjacent stones or plumb, true and level in full bed of mortar with vertical joints buttered and placed full. Completely fill anchor, dowel and lifting holes and voids left by removed edges.
  - .9 Apply pointing mortar. Fill raked joints with pointing mortar.
  - .10 Finish joints identical to existing.
  - .11 Keep fresh mortar damp for three (3) days and minimum temperature of 10 °C. Refer to section 04 03 07 - Historic - Masonry Repointing.
  - .12 Clean masonry as work progresses.
- .1 Remove mortar dropping from face of stone.
  - .2 Clear face of veneer masonry of any trace of mortar.
  - .3 Remove mortar residue from face of stone before mortar is set.
  - .4 Use only clean water and soft natural bristle brush to clean masonry.
  - .13 Inspect finished work with Departmental Representative.

### **3.6 FILLING JOINTS/POINTING**

- .1 Fill joints and point: in accordance with Section 04 03 07 - Historic - Masonry Repointing.

**3.7 CLEANING**

- .1 Confirm acceptance of mock-up cleaning operations to demonstration from Site Supervisor before starting cleaning work.
- .2 Clean stone work surfaces after repairs have been completed and mortar has set.
- .3 Clean stone surfaces of adhesive or mortar residue resulting from work performed without damaging stone or joints.
- .4 At work completion, clear site of debris, surplus material and equipment, leaving work area in clean and safe condition.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 04 03 08 – Historic – Mortaring.
- .2    Section 04 03 42 – Historic – Replacing stone
- .3    Section 04 05 00 – Common work results for masonry.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Develop a complete and detailed photographic corpus of the structures to be dismantles and reconstructed.

**1.3                QUALITY ASSURANCE**

- .1    Qualifications:
  - .1    Masonry Contractor: Work of this Section: executed by contractor specializing in historic stone conservation work, using similar stone dismantling techniques.
  - .2    Masonry contractor will have to be capable of demonstrating his skills and will present three (3) realizations in historic stone masonry work on projects of similar size and complexity to Work of this Contract during the last 10 years
  - .3    Supervisor:
    - .1    Provide competent trade foreperson specializing in type of work required.
    - .2    Foreperson experience: Minimum five (5) years successful experience in deconstruction of historic stone masonry. Must be present on site throughout work.
  - .4    Dismantlers of stonework: Workers to have minimum five (5) years record of successful stone masonry dismantling.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    Protect and store stones to facilitate their resetting.
  - .1    Store dismantled masonry units on wood pallets, protected from exposure to water, elements, and potential mechanical damage fully covered under polyethylene.
  - .2    Submit storage and identification system to Site Supervisor approval for .

**1.5                AMBIENT CONDITIONS**

- .1    Loosen wet masonry only when temperature is above 5 °C.
- .2    In temperature 5 °C and below:
  - .1    Keep stones dry.
  - .2    Protect wet stones from freezing.



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**Part 2 Products**

**2.1 MORTAR**

- .1 Mortar: in accordance with specifications in section 04 03 08 – Historic – Mortaring.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Examine masonry, staging and storage areas and notify Site Supervisor in writing of conditions detrimental to acceptable and timely completion of Work.

**3.2 PROTECTION**

- .1 Prevent damage to surrounding structures and features which are to remain. Make good damage incurred.
- .2 Protect surrounding components from damage during work.
- .3 Make good damage to historic fabric.
- .4 Obtain Site Supervisor's approval for repair methodology.

**3.3 MARKING AND RECORDING**

- .1 Mark stone, on face, before removal using marking product which can be completely erased when required without damaging masonry unit:
  - .1 Ball-point pen on diachylon, attached to stone.
  - .2 Waxless chalk directly on stone.
- .2 Develop a photographic documentary of structures to be dismantled and reconstructed, the number of each stone to appear on photographs.
- .3 Ensure that temporary marking will remain in use resistant to weather, handling and cleaning until final marking of stones (if required).
- .4 Remove markings and adhesive without damaging units. Use a brush with vegetable fibre, either dry or with water without damaging masonry units. Use no solvent, acid or other chemical product.
- .5 Make record of dimensions of each stone removed from structure.

**3.4 METHOD FOR LOOSENING STONES**

- .1 Use approved methods to loosen stones which will cause no damage either to stones or to other elements or features.
- .2 Use only hand held tools.
- .3 Obtain Site Supervisor's approval for use of power tools before commencing removal work.
- .4 No loosening or removal activity may be undertaken on wet masonry when temperature is above freezing.

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**3.5 SPECIAL TECHNIQUES**

- .1 Avoid damaging arrises of stone when removing mortar and freeing up.
- .2 Use wood wedges where required to remove or dislocate stone. Use flat pry bars protected with impact absorbing protection (burlap, cardboard).
- .3 Use nylon hoisting belts. Use minimum 2 belts per stone.
- .4 Use separators or wood shims to isolate units from hoisting belts and prevent damage to arrises of stone when hoisting and lifting from position or during handling along the wall.
- .5 Where damage occurs to stone, replace stone in accordance with Section 04 03 42 - Historic - Replacing Stone at own cost.

**3.6 TEMPORARY STORAGE**

- .1 Place stones in designated area of site for cleaning, detailed inspection and for final marking, before storage.
- .2 Make stones accessible and retrievable when required.

**3.7 HANDLING**

- .1 Place detached stones on wood surfaces during handling. Prevent contact with metal.
- .2 When stones are lowered to ground, place directly on wooden platform used for transport or storage.
- .3 Transport and keep stones on wooden platforms.
- .4 Ensure that sharp edges of stones do not come into contact with hard objects.

**3.8 CLEANING**

- .1 Do cleaning operations at above freezing temperature. After cleaning, protect wet stones against freezing until dry.
- .2 Clean stones by wet scrubbing with vegetable fibre brush unless otherwise instructed.
- .3 Remove excess mortar with hand tools.

**3.9 FILLING AND POINTING**

- .1 Fill masonry joints and point in accordance with section 04 03 07 Historic – Masonry Repointing.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 04 03 07 – Historic – Masonry repointing.
- .2    Section 04 03 08 – Historic – Mortaring.
- .3    Section 04 03 09 – Historic – Grouting.
- .4    Section 04 03 42 – Historic – Replacing stone.
- .5    Section 04 03 43 – Historic – Dismantling stone masonry

**1.2                REFERENCES**

- .1    CSA Group
  - .1    CAN/CSA-A371, Masonry Construction for Buildings.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Product Data:
  - .1    Submit manufacturer's instructions, printed product literature and data sheets for masonry and include product characteristics, performance criteria, physical size, finish and limitations.
- .2    Shop Drawings:
  - .1    Submit drawings stamped and signed by professional engineer registered or licensed in Quebec, Canada.
- .3    Samples:
  - .1    Provide samples required in accordance with section 01 33 00 – Submittal Procedures.
  - .2    Describe certificates intended to document affirmations by the Contractor or other entities that the work is in accordance with the Contract Documents.
- .4    Installer Instructions
  - .1    Provide manufacturer's installation instructions, including storage, handling, safety and cleaning.

**1.4                QUALITY ASSURANCE**

- .1    Mock-ups:
  - .1    Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
  - .2    Mock-up used:
    - .1    To judge quality of work, substrate preparation, operation of equipment and material application.
  - .3    Construct mock-up where directed Site Supervisor.

- .4 Allow 24 hours for inspection of mock-up by Site Supervisor before proceeding with work.
- .5 When accepted Site Supervisor, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.
- .6 Start work only upon receipt acceptance of mock-up by Site Supervisor.
- .7 Masonry contractor will have to be capable of demonstrating his skills and will present three (3) realizations in historic stone masonry work on projects of similar size and complexity to Work of this Contract during the last 10 years.
- .8 Execute work of this section by personnel experienced in preservation of historic masonry.
- .9 Masons engaged by Masonry Contractor to have minimum of five (5) years' experience with historic masonry.
- .10 All Masons engaged on this project must demonstrate their skills to reproduce the mock-up.
- .11 All Masons engaged during this project should meet the requirements above. When Masons leave the project, all alternative masons should meet the requirements too.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Keep materials dry. Protect against weather, freezing and any source of contamination.
- .4 Remove rejected or contaminated material from site.

#### **1.6 SITE CONDITIONS**

- .1 Ambient Conditions
  - .1 Assemble and erect components when temperatures are above 10 degrees C.
- .2 Cold weather requirements:
  - .1 To CAN/CSA-A371 with following requirements.
    - .1 Maintain temperature of mortar between 5 degrees C and 40 degrees C until batch is used or becomes stable.
    - .2 Maintain ambient temperature of masonry work and it's constituent materials between 10 degrees C and 27 degrees C and protect site from windchill.
    - .3 Maintain temperature of masonry above 10 degrees C for minimum of 30 days, after mortar is installed.
    - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.
- .3 Hot weather requirements:

- .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
- .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.
- .4 Spray mortar surface at intervals and keep moist for maximum of 3 days after installation.
- .5 Monitor and verify temperature daily on site to meet the specific requirements for temperature and humidity for work execution.

## **1.7 WARRANTY**

- .1 For Work in this Section 04 05 00 - Common Work Results for Masonry, 12 months warranty period is extended to 60 months.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Masonry materials are specified elsewhere in related Sections:
  - .1 Section 04 03 08 – Historic - Mortaring.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Protect adjacent materials from damage and disfiguration.

### **3.2 INSTALLATION**

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.

### **3.3 CONSTRUCTION**

- .1 Jointing: Section 04 03 07 – Historic – Masonry Repointing .
- .2 Replacing stone: Section 04 03 42 – Historic – Replacing stone.

### **3.4 SITE TOLERANCES**

- .1 Tolerances in notes to CAN/CSA-A371 apply.

### **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.

**3.6 PROTECTION**

- .1 Protect adjacent finished work against damage which may be caused by on-going work.

**END OF SECTION**

**Partie 1      General**

**1.1      DESCRIPTION**

- .1      This section specifies the requirements for the supply and installation of the elements required for waterproofing below grade structures.
- .2      Waterproofing system: Liquid membrane.

**1.2      RELATED WORK**

- .1      Section 31 23 33.01 Excavating, trenching and backfilling

**1.3      COMPLEMENTARY WORK TO BE EXECUTED BY THE SUB-CONTRACTOR**

**1.4      TECHNICAL DOCUMENTS**

- .1      Submit two (2) copies of the most current technical data sheets. These documents must describe the physical properties of the material, [and explanations about product installation, including installation techniques, restrictions, limitations and other manufacturer recommendations.

**1.5      CONTRACTOR QUALIFICATIONS**

- .1      Waterproofing work shall be performed only by skilled applicators, employed by an installation contractor operating all adequate and necessary equipment to execute such work in accordance with the manufacturer's recommendations and recognized standards.

**1.6      MANUFACTURER'S REPRESENTATIVE**

- .1      The waterproofing materials manufacturer may delegate a representative to visit the work site at commencement of work.
- .2      At all times, the contractor shall permit and facilitate access to the site by the manufacturer's representative cited above.

**1.7      MATERIALS STORAGE**

- .1      Pails of materials should be handled with care and proper equipment.
- .2      Pails of materials shall be carefully stored and adequately protected in accordance with the manufacturer's recommendations.

**1.8      QUALITY ASSURANCE AND ENVIRONMENTAL MANAGEMENT**

- .1      The manufacturer of elastomeric bitumen products will provide proof of ISO 9001 and ISO 14001 Certifications.

## **1.9 WARRANTIES**

- .1 The product manufacturer shall issue a written and signed document in the name of the owner, certifying the product will meet all the physical characteristic published by the manufacturer, for a period of 10 years, starting from the date of completion of installation of membranes. This warranty is only valid if drainage board are also installed. No letter amending the manufacturer's standard warranty will be accepted and the warranty certificate must reflect these requirements.

## **Partie 2 PRODUCTS**

### **2.1 WATERPROOFING COATING**

- .1 Description: Water-based single component rubberised liquid membrane.  
For applications at temperatures above 2°C only.
- .2 Properties:
  - .1 Film thickness: Wet – 2.0 mm (80 mil)  
Dry – 1.0 mm (40 mil)
  - .2 Color: Red
  - .3 Solids by weight (%): 48
  - .4 Water vapour permeance (ng/Pa·s·m<sup>2</sup>): ASTM E96 34 (0.6 perm)
- .3 Specified product: COLPHENE LM 300 by SOPREMA or its equivalent.

### **2.2 ACCESSORIES**

- .1 DRAINAGE BOARD
  - .1 Description: Dimpled high-density polyethylene panel.
  - .2 Characteristics:
    - .1 Compressive Strength (kPa): 400 (8400 psf)
    - .2 Roll dimensions: Width: 2.0 m - Length: 12.5 m
- .2 Specified product: SOPRADRAIN 10G by SOPREMA or its equivalent.



### **Partie 3 EXECUTION**

#### **3.1 SURFACE PREPARATION**

- .1 Surface examination and preparation must be completed in conformance with recommendations in the SOPREMA Specifications Manual.
- .2 Before waterproofing work begins, the owner's representative and the membrane contractor's foreman will inspect and approve substrate condition and ensure that related work has been properly executed. If necessary, a non-conformity notice will be issued to the contractor so that required corrections can be made. The start of the membrane application will mean that substrate conditions are acceptable for work completion.
- .3 Before commencing work, all surfaces must be smooth, dry, clean and free of ice and debris as per manufacturer's recommendations.
- .4 No materials will be installed during rain or snowfall.
- .5 Verify the compatibility of all membrane components with curing compounds, coatings or other materials which are already installed on the surfaces to be treated.
- .6 Any cracks over 3 mm wide should be reported. Upon approval from the qualified authority, the crack should be filled in with T grade air/vapour barrier coating. For cracks over 6 mm, a 150 mm (6 inches) wide strip of detail membrane should be installed, centered over the crack.

#### **3.2 METHOD OF EXECUTION**

- .1 Work shall be performed on a continuous basis as surface and weather conditions allow.
- .2 Adjoining surfaces shall be protected against any damage that could result from the waterproofing installation.

#### **3.3 EQUIPMENT**

- .1 Maintain all equipment and tools in good working order.

#### **3.4 WATERPROOFING COATING INSTALLATION**

- .1 The substrate must be clean, solid, and free of debris, grease and any contaminants, which may compromise adhesion.
- .2 COLPHENE LM 300 can be applied by spraying or using a roller. For roller application, anticipate changing the rolls regularly depending on weather conditions.
- .3 Install product as film 2.0 mm (80 mils) thick and measure with wet film gauge.
- .4 Any waterproofing membrane left exposed after backfilling shall be protected from ultra violet and mechanical damages.

**3.5 DRAINAGE BOARD INSTALLATION SOPRADRAIN 10G OR ITS EQUIVALENT**

- .1 Drape the drainage board and secure without fastening through the waterproofing membrane or tape to the waterproofing membrane.

**-END OF SECTION-**

## **Part 1      General**

### **1.1          REFERENCES**

- .1      Architectural Woodwork Manufacturers Association of Canada (AWMAC)
  - .1          Architectural Woodwork Quality Standards Illustrated - 8th Edition, 2003.
- .2      Canadian Standards Association (CSA International)
  - .1          CAN/CSA-O132.5-M1992(R1998), Stile and Rail Wood Doors.
  - .2          CAN/CSA-O141-05, Softwood Lumber.
- .3      National Lumber Grading Authority (NLGA)
  - .1          NLGA Standard Grading Rules for Canadian Lumber [2007].

### **1.2          DEFINITIONS**

- .1      Bolection moulding: a moulding on a panel that projects above the adjoining surfaces.
- .2      Box locks: a surface-mounted lock with the mechanism in a rectangular metal or wood casing.
- .3      Bead: a small, linear moulding with a round cross-section that ranges from quarter round to three quarter round.
- .4      Sticking: a planed moulding with a groove or a rabbet that holds a panel or window pane in place.
- .5      Batten door: a door formed of full height boards glued edge to edge with horizontal and vertical battens applied. A double batten door has battens on both sides.
- .6      Ledged door: a door with horizontal boards (ledges) used as cleats to fasten the vertical boards.
- .7      Haunched mortise and tenon: the tenon is narrower at the tip than the root.
- .8      Run through: the tenon is allowed to run through the mortised member for wedging.
- .9      Wedged: a wood wedge used in a dovetail-shaped mortise to secure a tenon.
- .10     Draw-bore pin: a tapered wood peg used to fasten a mortise and tenon joint.
- .11     Blind mortise: a mortise joint in which the tenon is entirely surrounded by wood.
- .12     Stub tenon: a short tenon used in a closed mortise joint.
- .13     Dowelled door: a wood door with rails and stiles fastened with dowels rather than tenons.
- .14     Tongued: a projecting portion of a member, such as a tenon.
- .15     Half-lapped: a lap joint in which a rectangular notch in the end of one wood member overlaps a corresponding rectangular notch in the end of another wood member.
- .16     Stop chamfered: a corner chamfer that does not extend to the end of the timber or moulding; typically terminated with a small, triangular plane surface.

### **1.3 QUALITY ASSURANCE**

- .1 Arrange for Site Supervisor to inspect period wood door fabrication shop prior to starting the Work.
- .2 Mock-ups:
  - .1 Prepare one (1) mock-up for inspection by Site Supervisor before proceeding with further Work.
- .3 Mock-up:
  - .1 Size: 600 mm x 600 mm.
  - .2 Surfaces: ready for coatings but not treated with coatings.
- .4 Notify Site Supervisor (48) hours in advance of required inspection.
- .5 Approved mock-up becomes standard of acceptance for finished Work.
- .6 Approval of mock up and approval of installation will not occur at the same time.
- .7 Approved mock-up will not be incorporated in finished work.

### **1.4 QUALIFICATIONS**

- .1 Provide corporate or individual resumes for proposed contractor and workers.
- .2 Carry out door fabrication work using skilled tradesperson trained and experienced in fabrication and installation of wood doors.
- .3 Provide documentation stating shop foreperson and personnel are of recognized standing in the industry, with a proven record of satisfactory door fabrication and installation over five (5) years. Obtain Site Supervisor's approval of this standing.
- .4 Door fabricators: experienced in use of materials. Supply job references showing door fabrication experience of similar size and scope as this project.
- .5 Competent worker: equipped with tools and equipment necessary to carry out work in a traditional manner.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Store or hang doors in enclosed space with controlled ambient temperature and relative humidity.
- .3 Protect doors from scratches, handling marks and other damage. Wrap or protect doors.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Wood used for new doors construction must be the same type of wood than the existing doors. If it was not possible to determine the existing type of wood or the type of wood is no longer available, the wood used must be white oak.

- .2 Hardwood lumber: to National Hardwood Lumber Association (NHLA) requirements, moisture content of maximum 12 %.
- .3 Fasteners: nails, wood screws, wood pegs, wood pins, wood glues: as per existing.
- .4 Hardware:
  - .1 Existing door hardware must be recovered and reused on new doors.
  - .2 Before relocation on new doors, hardware needs to be cleaned and painted with paint with the same characteristics as the existing hardware.
  - .3 In case of some existing hardware are extremely damaged to be reused on new doors, new hardware elements should be produced, similar to existing.

## **2.2 FABRICATION**

- .1 New doors must be made like existing doors.
- .2 Apply two coats of clear Pentox on each piece of wood before assembly.
- .3 Assemble and adjust door components before completed production. If hardware has been installed for adjustment, it should be remove prior painting.
- .4 If there are cuts and holes made in assembling the components, two (2) coats of Pentox should be applied on the entire new cuts and holes.
- .5 Before painting doors, obtain written authorization of the Site Supervisor
- .6 Doors shall be finished with two (2) coats of paint, same type and same color as the existing doors.
- .7 Hardware must be installed after door painting.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Contractor (Artisan) must take pictures before dismantling doors.
- .2 Doors installation details should be noted prior to the removal process to ensure that new doors will be install almost identically.
- .3 Copy of pictures and notes taken by Artisan must be transmitted to Site supervisor.
- .4 Existing doors should be dismantled and transported at the manufacturer's workshop to ensure an accurate reproduction of the elements, assembly and finish.
- .5 Hardware embedded in masonry must be removed and rehabilitated. If the withdrawal of the hardware involves too much masonry's demolition, Site Supervisor may ask for on the spot embedded hardware repair.

### **3.2 INSTALLATION**

- .1 Doors should be installed by the artisan who manufactured them.

**3.3 ADJUSTING**

- .1 At repair work completion, if required, the Artisan must make adjustments on the spot so that new doors will be installed in accordance with the installation of the existing doors.
- .2 If there are cuts and holes made in assembling the components, two (2) coats of Pentox should be applied on the entire new cuts and holes.

**END OF SECTION**

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Approved: 2007-12-31

## **Part 1            General**

### **1.1                RELATED REQUIREMENTS**

- .1        Section 04 03 42 – Historic – Replacing stone.
- .2        Section 04 03 43 – Historic – Dismantling stone masonry

### **1.2                REFERENCES**

- .1        Canadian Standards Association (CSA International)
  - .1        CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2        CAN/CSA O86.1, Engineering Design in Wood.
  - .3        CSA O121, Douglas Fir Plywood.
  - .4        CSA O122, Structural Glued-Laminated Timber.
  - .5        CSA O151, Canadian Softwood Plywood.
  - .6        CAN/CSA-S16, Limit States Design of Steel Structures.
  - .7        CSA W59, Welded Steel Construction (Metal Arc Welding).

### **1.3                DEFINITIONS**

- .1        Bracing: temporary support installed in excavation or structure to stabilize against deformations or failure.
- .2        Shoring: temporary support installed in an excavation or structure to relieve loads.

### **1.4                PERFORMANCE REQUIREMENTS**

- .1        Ensure that materials, equipment and procedures safely supporting existing structure and construction live loads; that allow work to be accomplished and that minimize risk of damage to historic and archaeological elements.

### **1.5                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Shop drawings to indicate shop and erection details in accordance with performance requirements in 1.4.
- .2        Submit to Site supervisor for review of shoring, bracing and temporary framing drawings signed by professional engineer registered or licensed in Quebec, Canada.
- .3        Site Supervisor will authorize dismantling or excavation work only after receiving engineer's written statement that bracing and shoring is adequately designed and complies with drawings.
- .4        Keep in mind that technological document in DWG format will not be provided to contractor or subcontractor.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Structural wood members: timber or glue laminated No. 1.
  - .1 Forest Stewardship Council (FSC) certified: FSC certified lumber.
- .2 Structural steel members: to CSA G40.21, grade 350, type W.
- .3 Nails: to CSA B111.
- .4 Bolts: lag screws, nuts and washers to CAN/CSA O86.1.
- .5 High-tensile bolts: to ASTM A325M or ASTM A490M.
- .6 Welding materials: CSA W59.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Remove machinery installations, utility services and stored materials. Store in area designated by Site Supervisor.
- .2 Before shoring or bracing is begun, drain areas adjacent to foundation, excavation or ground to support bracing. Maintain area dry for the duration of the contract.
- .3 Treat wood in contact with ground and water.

**3.2 INSTALLATION**

- .1 Obtain approval from Site supervisor, before execution, if alteration to bracing or shoring system is necessary.
- .2 Support individual elements that become loose during shoring or bracing installation.
- .3 Erect structural timber to CAN/CSA O86.1.
- .4 Erect structural steel work to CAN/CSA-S16 and CAN/CSA-S136.
- .5 Weld to CSA W59.
- .6 Bracing of structures:
  - .1 Install packing after review by Site Supervisor behind wall pieces to compensate for unevenness of wall surfaces.
  - .2 Install and use bracing system to stabilize deformations, as indicated on drawings.
- .7 Shoring of structures:
  - .1 Before final raking shores are erected, install temporary shores, consisting of an upright against wall and raker notched in, to stabilize wall.
  - .2 Install boards, between needles of dead shores, to prevent core escaping.



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- .3 Use hardwood blocks or wedges with mortar to offset the unevenness of walls or structures being supported.

**3.3 ADJUSTMENT**

- .1 Monitor bracing or shoring system performance and maintain its effectiveness by making adjustments and where needed replacing or repairing damaged and weakened elements of system.
- .2 Repair damage induced to portions of preserved structures or features at no extra cost to the Site Supervisor.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 31 32 19.01 - Geotextiles
- .2    Section 32 91 19.13 – Topsoil placement and grading
- .3    Section 32 92 23 - Sodding.
- .4    Section 32 93 10 – Trees, shrubs and ground cover planting

**1.2                REFERENCES**

- .1    American Society for Testing and Materials International (ASTM)
  - .1    ASTM C117, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2    ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3    ASTM D422-63], Standard Test Method for Particle-Size Analysis of Soils.
  - .4    ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5    ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6    ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2    Canadian General Standards Board (CGSB)
  - .1    CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2    CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3    Canadian Standards Association (CSA International)
  - .1    CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1    CSA-A3001, Cementitious Materials for Use in Concrete.
    - .2    CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4    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 : solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
- .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 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .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 fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.7 Unsuitable materials:

- .1 Weak, chemically unstable, and compressible 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 D422, ASTM C136: Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.
  - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
  - .2 Submit for review by Site Supervisor proposed dewatering and heave prevention methods as described in PART 3 of this Section.

- 
- .3 Submit to Site Supervisor written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
  - .4 Submit to Site Supervisor written notice when bottom of excavation is reached.
  - .3 Preconstruction Submittals:
    - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
    - .2 Submit records of underground utility locates, indicating:
      - .1 location plan of existing utilities as found in field;
      - .2 clearance record from utility authority;
      - .3 location plan of relocated and abandoned services, as required.
  - .4 Samples:
    - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
    - .2 Inform Site Supervisor at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
    - .3 Submit Ship samples [prepaid] to Site Supervisor, in tightly closed containers to prevent contamination and exposure to elements.
    - .4 At least 4 weeks prior to beginning Work, inform Site Supervisor source of fly ash and submit samples to Site Supervisor.
      - .1 Do not change source of Fly Ash without written approval of Site Supervisor.

## **1.5 QUALITY ASSURANCE**

- .1 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Quebec, Canada.
- .3 Engage services of qualified professional Engineer who is registered or licensed in Quebec, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .4 Do not use soil material until written report of soil test results are approved by Site Supervisor.
- .5 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.6 EXISTING CONDITIONS**

- .1 Examine soil report available at Annexe 1 of the present section.
- .2 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.

- 
- .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to beginning excavation Work, notify applicable Site Supervisor, establish location and state of use of buried utilities and structures. Site Supervisor to clearly mark such locations to prevent disturbance during Work.
  - .6 Confirm locations of buried utilities by careful test excavations.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered [as indicated].
  - .8 Record location of maintained, re-routed and abandoned underground lines.
  - .9 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
    - .1 Conduct, with Site Supervisor, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
    - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Site Supervisor
    - .3 Where required for excavation, cut roots or branches as directed by Site Supervisor.
  - .4 Archeology:
    - .1 Contractor shall co-operate and comply with directives set out in section 00 10 10 – Archaeological monitoring.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Type 1 and Type 2 fill: properties to the following requirements:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.

.3 Table:

Sieve Designation	% Passing	
Type 1	Type 2	
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Geotextiles: refer to section 31 32 19.01 - Geotextiles

### Part 3 Execution

#### 3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### 3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

#### 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 Site Supervisor approval.
- .4 Protect natural and man-made features required 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 required to remain undisturbed.

### **3.4 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as directed by Site Supervisor after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Site Supervisor.
  - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as indicated on drawings.
- .4 Dispose of unused topsoil off site.

### **3.5 STOCKPILING**

- .1 Stockpile fill materials in areas designated by Site Supervisor.
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

### **3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 General:
  - .1 Work execution by phases requires the construction of works to retain the water, to permit to execute the work by steps, without the presence of bothersome water.
  - .2 Design and choice of the type of watertight enclosure and of the type of cofferdams, of the materials used to realise them, of the construction method used, the choice of type of drying up method and of equipment required to dry up, maintenance work for the watertight enclosure and for the cofferdams, as well as work for operating and maintenance of the pumping equipment, and finally the removal method for the watertight enclosure, for the cofferdams and for the pumping systems, are the Contractor's responsibility.
- .2 Description:
  - .1 The work described in the following section covers:
    - .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements .
    - .2 Where conditions are unstable, Site Supervisor to verify and advice methods.
    - .3 Construct temporary Works to depths, heights and locations as approved by Site Supervisor
    - .4 Draining cofferdams with required pumping at all times as indicated in section 3.7
- .3 During backfill operation:

- 
- .1 Unless otherwise indicated or directed by Site Supervisor, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .4 Upon completion of substructure construction:
    - .1 Remove cofferdams, shoring and bracing.
    - .2 Remove excess materials from site and restore watercourses as directed by Site Supervisor.

### **3.7 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Site Supervisor's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures 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.
- .5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### **3.8 EXCAVATION**

- .1 Advise Site Supervisor at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as directed by Site Supervisor.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Site supervisor in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Site Supervisor.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.



- 
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
  - .11 Notify Site Supervisor when bottom of excavation is reached.
  - .12 Obtain Site Supervisor approval of completed excavation.
  - .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Site Supervisor.
  - .14 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.
  - .15 Install geotextiles in accordance with drawings.

### **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 D1557.
  - .1 Use Type 2 fill as shown on drawings. Compact to 95% of corrected maximum dry density.

### **3.10 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Site Supervisor has inspected and approved installations.
  - .2 Site Supervisor has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .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 backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Site Supervisor:
  - .2 If approved by Site Supervisor, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Site Supervisor.
- .6 Install drainage system in backfill as indicated by Site Supervisor.

**3.11 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Site Supervisor.
- .2 Replace topsoil as directed by Site Supervisor.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Rebuilt slope protective covering ramparts according with drawing indications and as directed by Site Supervisor.
- .6 Clean and reinstate areas affected by Work as directed by Site Supervisor.

**ANNEXE 1**



Montréal, le 13 novembre 2014

N/D : F4-14-0925

Monsieur Richard Grégoire, ing.  
*DESSAU*  
375, boulevard Roland-Therrien, bureau 400  
Longueuil (Québec) J4H 4A6

**Objet : EXPERTISE DE MAÇONNERIE ET GÉOTECHNIQUE**  
Fort-Lennox  
Saint-Paul-de l'île-Aux-Noix, Québec

Monsieur,

Suite à l'acceptation de notre proposition PF4-14-0760-1 datée du 24 septembre 2014, nous avons réalisé une expertise de maçonnerie et géotechnique dans le cadre du projet ci-haut mentionné. Le présent rapport résume nos observations des lieux, les travaux de chantier et de laboratoire effectués ainsi que nos commentaires et recommandations géotechniques au sujet des sols de fondation et de la maçonnerie, des murs de l'entrée principale de Fort-Lennox.

Nous espérons que ce rapport sera à votre entière satisfaction et demeurons à votre disposition pour tout renseignement complémentaire.

Nous vous prions de recevoir, Monsieur, nos salutations distinguées.

***Fondasol Inc.***

Mohammad Hosseini, ing., Ph. D., Dr  
Président

P. j. Rapports (un original et une copie)



**EXPERTISE DE MAÇONNERIE ET GÉOTECHNIQUE**

Fort-Lennox  
Saint-Paul de l'île-aux-Noix, Québec

N/D : F4-14-0925  
13 novembre 2014

**Présentée à :**

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Préparée par :

Mohammad Hosseini, ing., Ph. D., Dr  
Président

Distribution:  
Client (1 original et une copie)  
Fondasol Inc. (1 copie)

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Expertise géotechnique et de maçonnerie  
Fort-Lennox à St-Paul de l'île-aux-Noix (Québec)

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4. Résultats des essais de laboratoire
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## 1. INTRODUCTION ET HISTORIQUE

Les services des consultants en géotechnique de **Fondasol Inc.**, une division de Groupe ABS, ont été retenus par **Dessau** afin de réaliser quatre sondages géotechniques, pour carotter les blocs de maçonnerie de pierre de la porte d'entrée de Fort-Lennox et un forage géotechnique afin de déterminer la stratigraphie des sols et la profondeur du roc.

Selon les informations obtenues de Dessau (courriel du 26 août 2014) :

*«...le Fort-Lennox a été construit en 1820. La porte d'entrée, surmontée d'une arche, et les murs de maçonnerie s'y rattachant semblent subir un déversement vers les douves (plans d'eau entourant le fort). Les joints de mortier, réparés en 2012, ont déjà commencé à se fissurer. Les murs de maçonnerie reposeraient sur des caissons de bois lesquels reposent sur de l'argile (épaisseur entre 10 et 15 m. Afin d'établir la bonne stratégie de réfection et valider si la structure est effectivement en danger ou non, il faut valider la composition exacte, l'état et la résistance des murs, du mortier, des caissons de bois, de l'argile et du roc (si ce dernier est situé à moins de 20 m de profondeur). »*

L'objectif du présent mandat consistait à réaliser quatre sondages géotechniques de  $\pm 3$  m de profondeur pour le carottage des éléments de maçonnerie de pierre de l'arche de la porte d'entrée et des deux murs et un forage géotechnique pour déterminer la stratigraphie des sols en place et la profondeur du roc pour répondre aux questions de Dessau en vue d'établir la bonne stratégie d'intervention pour les travaux de réfection proposés pour la porte d'entrée principale de Fort-Lennox et des deux murs adjacents.

Le présent rapport résume les travaux de chantier et de laboratoire réalisés ainsi que nos commentaires et recommandations géotechniques au sujet des pierres de maçonnerie carottées, des sols de fondation et du roc en place.

Une série d'annexes suit le texte du rapport. L'annexe 1 contient les plans de localisation du site à différentes échelles, les photo-aériennes, les photos de Google et le plan topographique du secteur. Le plan de localisation des sondages (carottages) et du forage réalisés est joint à l'annexe 2. Les rapports des sondages et du forage réalisés sont joint à l'annexe 3. Les résultats des essais de laboratoire sont joints à l'annexe 4. L'annexe 5 contient les photographies décrivant l'état des lieux. Les extraits de la carte de sol consultée sont joints à l'annexe 6 du rapport. Les extraits des documents consultés sont joints à l'annexe 7 du rapport.

## 2. LOCALISATION DU SITE

Le fort-Lennox est situé au milieu de la rivière Richelieu à St-Paul-de-l'île-aux-Noix. Les plans joints à l'annexe 1 montrent l'emplacement du site. Deux photos - aériennes de Google, jointes à l'annexe 1, illustrent la configuration de Fort-Lennox. Les bâtiments de Fort-Lennox sont entourés d'un plan d'eau avec un accès par une passerelle en bois. La photo-aérienne, fournie par Dessau, copie jointe à l'annexe 1, montre l'emplacement du site au sein de la rivière Richelieu.

Selon le plan topographique consulté, copie jointe à l'annexe 1, les élévations des terrains du secteur sont de  $\pm 30$  m. Selon ce plan, les dimensions de Fort-Lennox sont de  $\pm 250$  m par  $\pm 350$  m. L'accès à l'île Fort-Lennox se fait par une chaloupe au moyen de deux quais situés au



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1, 61<sup>e</sup> Avenue et l'île Fort-Lennox, tel qu'illustré sur le plan topographique.

L'état des lieux est décrit au moyen de photos jointes à l'annexe 5. Ces photos ont été prises lors de nos trois visites effectuées le 4 septembre (visite pour proposition) et les 14 et 15 octobre, lors des travaux de chantier.

La photo 1 montre une vue d'ensemble de l'entrée de Fort-Lennox avec la passerelle et la douve en avant plan.

La photo 2 montre la plaque de la Commission des lieux et monuments historiques du Canada avec la note explicative sur l'histoire de Fort-Lennox.

La photo 3 montre une vue d'ensemble de la porte d'entrée et des murs de soutènement en pierres, adjacents, ainsi que des pièces avec des toits en dôme (voûte) gazonnés. Ainsi, de part et d'autre de la porte d'entrée, des pièces construites en maçonnerie de pierres ou de brique, avec des toits en voûte sont présentes. Une des particularités du site est qu'une couverture végétale recouvre les ouvrages en voûtes situés de part et d'autre de la porte d'entrée.

La photo 4 montre l'arche de la porte d'entrée. Le toit de l'arche est composé d'un revêtement métallique.

La photo 5 montre une vue rapprochée des deux murs en maçonnerie adjacents à la porte d'entrée. Des indices d'efflorescence sont présents sur certains blocs de pierre.

La photo 6 montre une vue d'ensemble des ouvrages situés de part et d'autre de la porte d'entrée. Les photos 7 et 8 montrent la couverture végétale de toiture, en pente, des ouvrages existants.

La photo 9 montre la passerelle d'accès à Fort-Lennox à travers le plan d'eau existant.

La photo 10 montre les ouvrages situés à droite de la porte, en regardant Fort-Lennox par la passerelle existante.

Les photos 11 à 17 montrent les pierres de couronnement des murs de maçonnerie.

La photo 18 montre le revêtement métallique de toiture de l'arche de la porte d'entrée. Pour les travaux de sondages, ce revêtement métallique a été enlevé.

Les photos 19 et 22 montrent l'intérieur des locaux en maçonnerie situés de part et d'autre de la porte d'entrée.

Les photos 23 à 32 montrent les dommages présents sur les blocs de pierre des murs de maçonnerie.

La photo 33 montre le quai de parc Canada, avec la barge utilisée pour le transport d'équipement et de personnel.

Les photos 34 à 37 montrent les travaux de préparation effectués pour permettre d'effectuer les sondages C-1 et C-2, situés au toit de l'arche (voûte) d'entrée principale.





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### 3. CARTE DE SOL CONSULTÉE

Selon la carte de sol accompagnant le rapport de ET 83-21 intitulée « géologie des sédiments meubles de la région de Lacolle-St-Chrysostome, Lasalle (1981), les dépôts meubles entourant l'île Fort-Lennox sont composés soit de sédiments d'eau relativement profonde de la mer de Champlain, composés d'argile, argile silteuse et silt (légende 4 de la carte), soit de sédiments de plains alluviaux actuels, composés de sable, silt, argile et débris organiques (légende 8 de la carte).

Les extraits de la carte de sol consultée sont joints à l'annexe 6 du rapport.

### 4. TRAVAUX DE CHANTIER

Les travaux de chantier du présent mandat ont consisté en la réalisation de quatre sondages géotechniques, pour le carottage de maçonnerie de 2,8 à 3,7 m de profondeur et d'un forage géotechnique avec le carottage du roc d'une profondeur 19,2 m.

L'emplacement des sondages et du forage réalisés avait été déterminé par Dessau, selon un plan fourni. Le soussigné a procédé à l'implantation des sondages et du forage en tenant compte des contraintes de sécurité et des services souterrains présents pour le forage. Malgré l'information à l'effet que des conduites souterraines seraient présentes, cependant l'emplacement exact des conduites n'était pas connu. Fondasol avait demandé que l'emplacement des conduites souterraines soit marqué, sur place, par de la peinture, ce qui n'a pas été effectué compte tenu de l'incertitude sur l'emplacement exact. Initialement, le forage 14F-01 a été placé à 0,9 m du mur gauche, pour des questions de manœuvre sécuritaire de foreuse. Cependant, la tarière de la foreuse a intercepté la paroi d'une conduite souterraine. Suite à cette interception de conduites, le forage a été déplacé pour le situer à environ 0,6 m du mur gauche.

Le forage a été réalisé à l'aide d'une foreuse conventionnelle, de marque CME, modèle 45, montée sur une plate-forme portée par chenillards, utilisant des tarières évidées pour le creusage des dépôts meubles. Un carottier, de type cuillère fendue de calibre N ou B a servi au prélèvement des échantillons des sols naturels et à la détermination de l'indice « N » de l'essai de pénétration standard conformément à la norme ASTM D-1586, (photos 27 à 40 de l'annexe 5). L'échantillonneur a été enfoncé dans les sols par battage au moyen d'une masse de 63 kg (140 lb) avec une hauteur de chute de 750 mm. Le nombre total de coups nécessaire pour enfoncer la cuillère fendue (échantillonneur) sur chaque course de 150 mm a été enregistré et rapporté dans les rapports des forages. Un carottier double, de calibre NQ, a été utilisé pour le carottage du roc.

Le trou du forage a été remblayé à la fin des travaux par de la pierre concassée.

La résistance au cisaillement du dépôt d'argile a été mesurée sur place au moyen d'un scissomètre.

Les sondages (carottages) ont été effectués au moyen de deux carotteuses électriques portatives, munies de mèches diamantées de diamètre de 100 et 45 mm. Les sondages C4 et C2 ont été effectués au moyen d'une carotteuse avec un carottier simple et des rallonges, tandis que les sondages C3 et C1 ont été effectués avec une carotteuse conventionnelle munie d'un carottier double.



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Les photos jointes à l'annexe 5 décrivent les travaux réalisés, dans l'ordre chronologique des travaux.

La photo 38 montre l'emplacement du sondage (carottage) C-4. Les photos 38 à 48 montrent les carottes de pierre prélevées dans le mur de maçonnerie à l'emplacement du sondage C-4 au fur et à mesure de carottage. Ce dernier a été effectué au moyen d'une carotteuse électrique avec une mèche diamantée de diamètre de 100 mm et de 45 mm, photo 36.

La photo 49 montre l'emplacement du sondage C-3, effectué par une deuxième équipe, au moyen d'une carotteuse portable. Les photos 49 à 57 montrent les carottes de pierre ou de mortier prélevées au fur et à mesure du carottage.

La photo 58 montre l'emplacement du sondage C-2, situé sur la partie gauche du toit de la voûte d'entrée principale. Contrairement aux emplacements des sondages C-3 et C-4, la surface de toit n'est pas régulière, mais plutôt rugueuse, ce qui a constitué une contrainte pour l'ancrage de la carotteuse. Les photos 59 à 68 montrent les échantillons de matériaux (pierre, mortier de ciment et de chaux) prélevés dans le sondage au fur et à mesure de carottage. Les photos 69 à 72 montrent l'intérieur du trou du sondage C-2.

La photo 73 montre la carotteuse installée à l'emplacement du sondage C-1, situé dans la partie droite du toit de la porte d'entrée principale. Les photos 74 à 83 montrent les échantillons de pierre prélevés dans le sondage C-1 au fur et à mesure du carottage. Les photos 84 et 85 montrent l'intérieur du trou du sondage C-1. La photo 86 montre l'emplacement du sondage C-1.

Les photos 87 et 88 montrent la foreuse en opération à l'emplacement du forage 14F-01 réalisé. Ce dernier a été placé à l'extrémité de l'allée d'entrée principale. Initialement, le forage a été placé à 0,9 m de distance du mur, pour des raisons de sécurité et de manœuvre. La tarière évidée de la foreuse a intercepté la paroi d'une série de trois fils électriques, photo 89. Le personnel de Parc Canada a procédé à la réparation des fils électriques endommagés, photos 90 et 91. Le forage a été déplacé pour être situé à 0,6 m du mur gauche.

Les photos 92 et 93 montrent les échantillons de remblai prélevés jusqu'à 2,2 m de profondeur dans le forage.

La photo 94 montre la fondation en pierre, échantillonnée entre 2,1 et 3,0 m de profondeur dans le forage 14F-01.

Les photos 95 à 99 montrent les échantillons d'argile prélevés dans le forage, entre 3,0 et 16,4 m de profondeur.

Les photos 100 et 101 montrent les carottes de roc prélevées dans le forage 14F-01, entre 16,4 et 19,2 m. Le roc est composé du shale calcaireux, fissile.

La photo 102 montre une vue d'ensemble des échantillons de matériaux prélevés dans le sondage C-1.

La photo 103 montre une vue d'ensemble des échantillons de matériaux prélevés dans le sondage C-2.

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La photo 104 montre une vue d'ensemble des échantillons de matériaux prélevés dans le sondage C-3.

La photo 105 montre une vue d'ensemble des échantillons de matériaux prélevés dans le sondage C-4.

## 5. DESCRIPTION DES SOLS ET DU ROC

La stratigraphie des sols échantillonnés à l'emplacement du forage 14F-01 réalisé, est composée d'une couche de remblai de 2,1 m d'épaisseur suivie d'une couche de blocs de pierre, provenant probablement de la fondation des murs de maçonnerie, suivie à 3,0 m de profondeur d'un dépôt d'argile silteuse marine de la mer de Champlain. Les résistances au cisaillement du dépôt d'argile, mesurées sur place au moyen d'un scissomètre, ont été de 40 et 35 kPa vers 4,5 et 6,0 m de profondeur, indiquant une argile de consistance ferme. Le roc a été intercepté vers 16,4 m de profondeur; il a été carotté jusqu'à 19,2 m. Il s'agit de shale calcaireuse, fissile. La particularité mécanique du roc carotté est sa fissilité, soit son aptitude à se diviser en lamelles sous une faible charge de traction. Par ailleurs, les carottes de roc prélevées se sont brisées facilement sous le moindre effort de flexion ou de traction en laboratoire. Compte tenu de cette propriété particulière, sa résistance en traction est négligeable et n'a pas pu être mesurée en laboratoire à cause de sa fissilité.

Des essais de laboratoire ont été réalisés sur certains échantillons d'argile prélevés. Les résultats des essais réalisés sont joints à l'annexe 4 du rapport. Le tableau 2 résume ces résultats. Selon ces résultats, le dépôt d'argile est composé de deux unités distinctes. L'unité de surface jusqu'à ±9 m de profondeur, est composée d'argile silteuse de type CH avec des teneurs en eau naturelle de 57,0 et 57,9 % avec un indice de liquidité de 0,83 et une limite de liquidité de 63,1 %. L'unité inférieure est composée d'argile de plasticité moyenne de type CL avec des teneurs en eau naturelle de 41,1 et 37 %, avec un indice de liquidité de 0,91 et une limite de liquidité de 42,9 %.

Des essais d'indice de résistance,  $I_{S50}$ , ont été effectués sur les carottes de pierre prélevées dans les sondages et les carottes de roc prélevées dans le forage. Les résultats des essais réalisés sont joints à l'annexe 4 du rapport. La résistance en compression simple du roc,  $C_0$ , est obtenue par la corrélation empirique suivante :  $C_0 = 25 I_{S50}$ . Les valeurs de résistance ainsi évaluées sont reportées sur les rapports de sondages et de forage.

**Tableau 1 : stratigraphie des matériaux échantillonnés dans le forage 14F-01**

Forage	Remblai	Fondation en pierre	Argile	Roc
14F-01	0,0 - 2,1 m	2,1 - 3,0 m	3,0 - 12,0 m	16,4 - 19,2 m



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Tableau 2 : Résultats des essais de laboratoire réalisés

Échantillon	Profondeur (m)	Teneur en eau (%)	Limite de liquidité (%)	Limite de plasticité (%)	Indice de liquidité
14F-01, CF-5	6,1 - 6,7	57,0	63,1	27,0	0,83
CF-6	7,6 - 8,2	57,9	-	-	-
CF-7	9,1 - 9,7	41,1	42,9	21,4	0,91
CF-8	10,7 - 11,3	37,0	-	-	-

## 6. COMMENTAIRES ET RECOMMANDATIONS

Basés sur les données obtenues lors du présent mandat, nous formulons les commentaires et recommandations suivants :

1. L'objet du présent mandat porte sur les deux murs de maçonnerie de la porte d'entrée principale de Fort-Lennox, situé au milieu de la rivière Richelieu à St-Paul-de-l'île-aux-Noix. Selon les informations disponibles, la construction de Fort-Lennox remonte vers les années 1820. Les visites effectuées lors du présent mandat ont permis de constater que les blocs de pierre de maçonnerie des murs sont affectés, entre autre, par les dommages résultants de la déficience de drainage des murs existants. Les dommages visibles se résument en la présence de dépôts d'efflorescence et de l'altération de certaines pierres, due probablement au gel de la pierre saturée d'eau durant la période de gel. Ces indices témoignent que le drainage des ouvrages existants est déficient et qu'il y a lieu d'améliorer le drainage des murs
2. Les sols échantillonnés à l'emplacement du forage 14F-01 réalisé, situé à 0,6 m du mur de maçonnerie, sont composés d'une couche de remblai de 2,1 m d'épaisseur suivie de blocs de roc, correspondant probablement à la semelle de fondation du mur de maçonnerie, suivie d'un dépôt d'argile marine de la mer de Champlain de consistance ferme, composé de deux unités d'argile CH jusqu'à ±9 m, suivi d'argile CL, avec le roc carotté entre 16,4 et 19,2 m de profondeur. Le roc est identifié comme du shale calcaireux, avec des indices RQD de 46 et 88 %, indiquant un roc de **mauvaise qualité à bonne qualité**. Selon les essais réalisés, la résistance en compression simple du roc est évaluée à environ 67 et 90 MPa; cependant, compte tenu de son caractère fissile, la résistance en traction du roc est négligeable. Les photos 95 à 99 montrent les échantillons d'argile prélevés dans le forage 14F-01, entre 3,0 et 16,4 m de profondeur. Les photos 100 et 101 montrent les carottes de roc prélevées dans le forage 14F-01, entre 16,4 et 19,2 m ;
3. À l'emplacement du sondage C-1, situé dans la partie droite de toit de l'entrée principale, les pierres de maçonnerie ont été carottées jusqu'à 3,7 m de profondeur. Le rapport de carottage 14C-01 illustre la stratigraphie des matériaux carottés dans le sondage. Selon les essais d'indice de résistance effectués sur les morceaux de pierre

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prélevés dans le sondage, la résistance en compression simple du roc intact varie entre 35 et 175 MPa, ce qui représente une grande dispersion de résultats. Les photos 74 à 83 montrent les échantillons de pierre prélevés dans le sondage 14C-1 au fur et à mesure de carottage ;

4. À l'emplacement du sondage C-2, situé dans la partie gauche de toit de l'entrée principale, les pierres de maçonnerie ont été carottées jusqu'à 3,7 m de profondeur. Le rapport de carottage 14C-02 illustre la stratigraphie des matériaux carottés dans le sondage. Selon les essais d'indice de résistance effectués sur les morceaux de pierre prélevés dans le sondage, la résistance en compression simple du roc intact varie entre 47 et 110 MPa. Les photos 59 à 68 montrent les échantillons de matériaux (pierre, mortier de ciment et de chaux) prélevés dans le sondage au fur et à mesure de carottage;
5. À l'emplacement du sondage 14C-3, situé dans la partie droite du mur de maçonnerie, les pierres de maçonnerie ont été carottées jusqu'à 3,6 m de profondeur. Le rapport de carottage 14C-03 illustre la stratigraphie des matériaux carottés dans le sondage. Selon les essais d'indice de résistance effectués sur les morceaux de pierre prélevés dans le sondage, la résistance en compression simple du roc intact des pierres de maçonnerie varie entre 110 et 160 MPa. Plusieurs morceaux de mortier de chaux ont été prélevés dans ce sondage. Les photos 49 à 57 montrent les carottes de pierre ou de mortier prélevés au fur et à mesure du carottage dans le sondage 14C-03 ;
6. À l'emplacement du sondage 14C-4, situé dans la partie gauche du mur de maçonnerie, les pierres de maçonnerie ont été carottées jusqu'à 2,8 m de profondeur. Le rapport de carottage 14C-04 illustre la stratigraphie des matériaux carottés dans le sondage. Selon les essais d'indice de résistance effectués sur les morceaux de pierre prélevés dans le sondage, la résistance en compression simple du roc intact des pierres de maçonnerie varie entre 62 et 147 MPa. Les photos 38 à 48 montrent les carottes de pierre prélevées dans le mur de maçonnerie à l'emplacement du sondage 14C-4, au fur et à mesure de carottage.

Nous espérons que ce rapport sera à votre entière satisfaction et demeurons à votre disposition pour tout renseignement complémentaire.

Nous vous prions de recevoir, Monsieur, nos salutations distinguées.

***Fondasol Inc.***

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Mohammad Hosseini, ing., Ph. D., Dr  
Président

P. j. annexes 1 à 7



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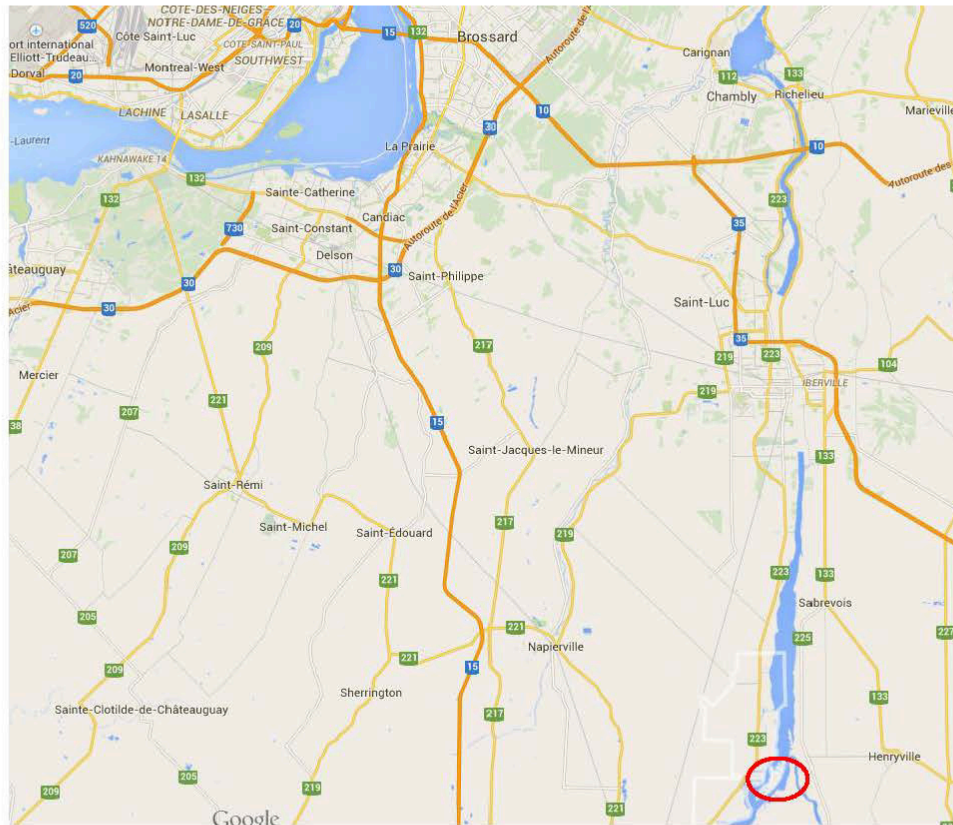
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**Annexe 1**  
**Plan de localisation**

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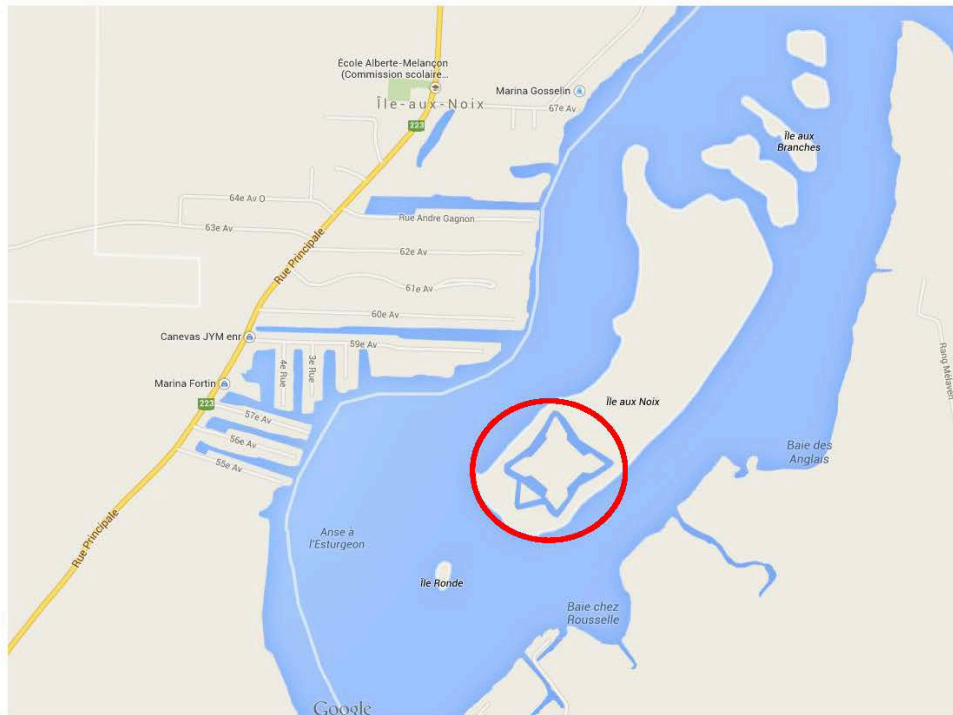
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Plan de localisation (Google)

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**Plan de localisation (Google)**



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Photo-aérienne de St-Paul-de-l'île-aux-Noix (Google)

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Photo-aérienne de Fort Lennox (Google)

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**Configuration de Fort-Lennox (±250 m x ±360 m)**

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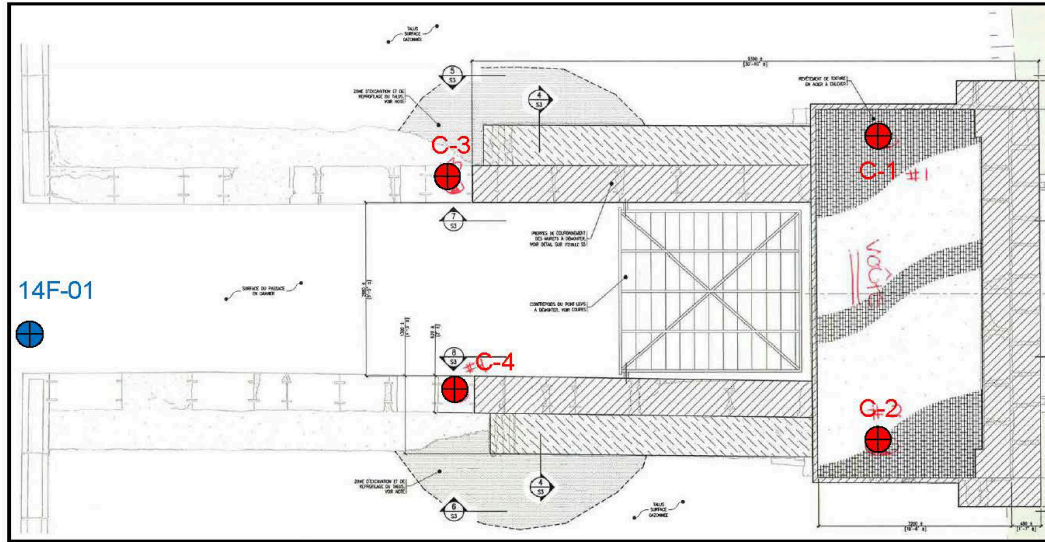
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**Annexe 2**  
**Plan de localisation des carottages et du forage réalisés**



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Plan de localisation des carottages et du forage réalisés






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**Annexe 3 :**  
**Rapports des carottages et du forage réalisés**








RAPPORT DE SONDAGE		 <small>Étude et expertise géotechnique Pathologie des fondations et des bâtiments Conception et consultation géotechnique</small>		SONDAGE N° 14 F-01					
Nom du projet : Carottage des murs de maçonnerie à Ford Lenox				N/D : F4-14-0925					
Nom du client : Dessau				V/D :					
Localisation : 61 <sup>ème</sup> avenue, St-Paul-De l'île-Aux-Noix Québec				Coordonnées géodésiques (NAD-1983 SCOPQ) X: Y: Z:					
Entrepreneur en forage:				Plan de localisation No. :					
Type de forage : Tarière évidée et forage au diamant				Date du début du forage : 2014-10-14					
Diamètre du forage:				Profondeur du forage : ( m) 19.21					
Technicien de chantier : Mohammad Hosseini				Réalisé par : Chafik, Bahloul.					
<b>TYPE D'ÉCHANTILLON</b> CF Cuillère fendue TM Tube à paroi mince CR Carottage au diamant TA Tarière MA Manuel		<b>TERMINOLOGIE</b> "traces" 1-10% "un peu" 10-20% adjectif (...eux) 20-35% "et" 35-50%		<b>INDICE DE QUALITÉ DU ROC</b> % RQD QUALIFICATIF <25 Très mauvaise 25-50 Mauvaise 50-75 Moyenne 75-90 Bonne 90-100 Excellente					
<b>ÉTAT DE L'ÉCHANTILLON</b>  Remanié  Intact (tube à paroi mince)  Pardus  Forage au diamant		<b>SYMBOLES</b> N: Indice de pénétration standard R: Refus (N > 50) R.Q.D: Indice de qualité du roc (Rock Quality Designation) % R.Q.D = $\frac{\sum \text{Carottes} > 4 \text{ po. (10 cm)}}{\text{longueur forée}}$		<b>INDICE "N"</b> Très lâche 0-4 Lâche 4-10 Compact 10-30 Dense 30-50 Très dense >50					
<b>CLASSIFICATION (SYSTÈME UNIFIÉ)</b> Argile < 0,002 mm Silt 0,002 à 0,075 mm Sable 0,075 à 4,75 mm Gravier 4,75 à 75 mm Cailloux 75 à 300 mm Blocs > 300mm		<b>CONSISTANCE DES SOLS COHÉRENTS</b> Très molle Molle Ferme Raide Très raide Dure		<b>RÉSISTANCE AU CISAILEMENT (Cu)</b> <12 kPa 12-25 kPa 25-50 kPa 50-100 kPa 100-200 kPa >200 kPa					
<b>NIVEAU D'EAU</b> Venue d'eau Niveau stabilisé de la nappe phréatique		Date: Prof.:		Date: Prof.:					
PROFONDEUR (m)	STRATIGRAPHIE		ÉCHANTILLONS			COUPS/15cm RQD	GRAPHIQUE	ESSAIS	
	PROF. - pi	NIVEAU (m)/ PROFONDEUR	DESCRIPTION DU SOL ET DU ROC	SYMBOLES	TYPE ÉCHANTILLON NO.				SOUS-ÉCH.
0.00	0.00	Niveau							
1.52	-1.52	Pierre concassée		CF-1			67	13	8-6-7-15
2.13	-2.13	Remblai de sable silteux avec un peu de gravier		CF-2			67	48	9-25-23-25
2.13	-2.13	Blocs de roc		CR-3			53		
3.05	-3.05	Argile silteuse, grise		CF-4			75		
6.10	-6.10	Argile silteuse, grise foncée avec traces de matière organique, devenant brun-gris, CH		CF-5			0	0	0-0-0
7.62	-7.62	Argile silteuse, grise foncée devenant rosâtre		CF-6			100	0	0-0-0
9.15	-9.15	Argile silteuse, rosâtre, CL		CF-7			0	0	0-0-0
10.67	-10.67	Argile silteuse, rosâtre		CF-8			0	0	0-0-0-0
16.48	-16.48	Shale calcaireuse, noire, fissile		CR-9			72	45.5	
18.14	-18.14	Shale calcaireuse, noire, fissile		CR-10			87.5	87.5	
19.21	-19.21	FIN DE SONDAGE							
20.65	-20.65								
Remarque(s):									
Vérifié par : Mohammad Hosseini Ing, Ph.D, Dr									
Date de production 2014-11-13									

RAPPORT DE SONDAGE				SONDAGE N° 14 C1									
Nom du projet : Carottage des murs de maçonnerie à Ford Lennox Nom du client : Dessau Localisation : 61 <sup>ème</sup> avenue, St-Paul-De l'île-Aux-Noix (Québec) Entrepreneur en forage : Type de forage : Forage manuel Diamètre du forage : Technique de chantier : Mohammad Hosseini				N/D : F4-14-0925 V/D : Coordonnées géodésiques (NAD-1983 SCOPQ) X: Y: Z: Plan de localisation No. : Date du début du forage : 2014-10-14 Profondeur du forage : ( m ) 3.66									
<b>TYPE D'ÉCHANTILLON</b> CF Cuillère fendue TM Tube à paroi mince CR Carottage au diamant TA Tarière MA Manuel		<b>TERMINOLOGIE</b> "traces" 1-10% "un peu" 10-20% adjectif (...eux) 20-35% "et" 35-50%		<b>INDICE DE QUALITÉ DU ROC</b> % RQD QUALIFICATIF <25 Très mauvaise 25-50 Mauvaise 50-75 Moyenne 75-90 Bonne 90-100 Excellente		<b>COMPACTITÉ</b> Très lâche 0-4 Lâche 4-10 Compact 10-30 Dense 30-50 Très dense >50		<b>INDICE "N"</b> 0-4 4-10 10-30 30-50 >50		<b>NIVEAU D'EAU</b> Date: Prof.:			
<b>ÉTAT DE L'ÉCHANTILLON</b>  Remanié  Intact (tube à paroi mince)  Perdu  Forage au diamant		<b>SYMBOLES</b> N: Indice de pénétration standard R: Refus (N > 50) R.Q.D: Indice de qualité du roc (Rock Quality Designation) % R.Q.D = $\frac{\sum \text{Carottes} > 4 \text{ po. (10 cm)}}{\text{longueur forée}}$		<b>CLASSIFICATION (SYSTÈME UNIFIÉ)</b> Argile < 0,002 mm Silt 0,002 à 0,075 mm Sable 0,075 à 4,75 mm Gravier 4,75 à 75 mm Cailloux 75 à 300 mm Blocs > 300mm		<b>CONSISTANCE DES SOLS COHÉRENTS</b> Très molle Molle Ferme Raide Très raide Dure		<b>RÉSISTANCE AU CISAILEMENT (Cu)</b> <12 kPa 12-25 kPa 25-50 kPa 50-100 kPa 100-200 kPa >200 kPa		Venue d'eau Niveau stabilisé de la nappe phréatique			
PROFONDEUR (m)	STRATIGRAPHIE		ÉCHANTILLONS				COUPS/15cm RQD	GRAPHIQUE			Niveau d'eau	ESSAIS	
	PROF. - pi	NIVEAU (m)/ PROFONDEUR	SYMBOLES	TYPE ÉCHANTILLON NO	SOUS-ÉCH.	ÉTAT		RECUPÉRATION %	N, R ou RQD	W <sub>p</sub>			W <sub>s</sub>
		0.00	Niveau										
		-0.71	Pierre de calcaire avec passées argileuses	C1-1									Is(a) = 3,3 MPa
		0.71	Mortier, la chaux	C1-2									Is(a) = 5,0 MPa
		-0.75	Pierre de calcaire avec passées argileuses	C1-3									Is(d) = 5,6 MPa
		0.75		C1-4									
				C1-5									Is(d) = 4,6 MPa
				C1-6									Is(a) = 1,4 MPa Is(a) = 4,7 MPa
		-2.74	Mortier, la chaux	C1-7									Is(a) = 6,9 MPa Is(d) = 7,1 MPa Is(d) = 7,1 Mpa
		2.74	Pierre de calcaire avec passées argileuses										
		-2.77											
		2.77											
		-3.66	FIN DE SONDAGE										
		3.66											
Remarque(s):  Vérifié par : Mohammad Hosseini Ing,Ph.D,Dr Date de production 2014-11-13													

RAPPORT DE SONDAGE		Fondasol <small>Étude et expertise géotechnique Pathologie des fondations et des bâtiments Conception et consultation géotechnique</small>		SONDAGE N° 14 C2			
Nom du projet : Carottage des murs de maçonnerie à Ford Lennox				N/D : F4-14-0925			
Nom du client : Dessau				V/D :			
Localisation : 61 <sup>ème</sup> avenue, St-Paul-De l'île-Aux-Noix Québec				Coordonnées géodésiques (NAD-1983 SCOPQ) X: Y: Z:			
Entrepreneur en forage: Forage manuel				Plan de localisation No. :			
Diamètre du forage: Diamètre du carotier:				Date du début du forage: 2014-10-14			
Technicien de chantier : Mohammad Hosseini				Profondeur du forage : ( m). 3.66			
TYPE D'ÉCHANTILLON		TERMINOLOGIE	INDICE DE QUALITÉ DU ROC	COMPACTITÉ	INDICE "N"	NIVEAU D'EAU	
CF Cuillère fendue TM Tube à paroi mince CR Carottage au diamant TA Tarière MA Manuel		"traces" 1-10% "un peu" 10-20% adjectif (...eux) 20-35% "et" 35-50%	% RQD QUALIFICATIF <25 Très mauvaise 25-50 Mauvaise 50-75 Moyenne 75-90 Bonne 90-100 Excellente	Très lâche 0-4 Lâche 4-10 Compact 10-30 Dense 30-50 Très dense >50	Date: Prof.:	Date: Prof.:	
ÉTAT DE L'ÉCHANTILLON		SYMBOLES	CLASSIFICATION (SYSTÈME UNIFIÉ)	CONSISTANCE DES SOLS COHÉRENTS	RESISTANC AU CISAILEMENT (Cu)	Niveau d'eau	
Remanié Intact (tube à paroi mince) Perdu Forage au diamant		N: Indice de pénétration standard R: Refus (N > 50) R.Q.D: Indice de qualité du roc (Rock Quality Designation) % R.Q.D = $\frac{\sum \text{Carottes} > 4 \text{ po. (10 cm)}}{\text{longueur forée}}$	Argile < 0,002 mm Silt 0,002 à 0,075 mm Sable 0,075 à 4,75 mm Gravier 4,75 à 75 mm Cailloux 75 à 300 mm Blocs > 300mm	Très molle <12 kPa Molle 12-25 kPa Ferme 25-50 kPa Raide 50-100 kPa Très raide 100-200 kPa Dure >200 kPa	<12 kPa 12-25 kPa 25-50 kPa 50-100 kPa 100-200 kPa >200 kPa	▽ Venue d'eau ▽ Niveau stabilisé de la nappe phréatique	
PROFONDEUR (m)	STRATIGRAPHIE		ÉCHANTILLONS			GRAPHIQUE	ESSAIS
	PROF - pi	DESCRIPTION DU SOL ET DU ROC	SYMBOLES	TYPE ÉCHANTILLON NO	SOUS - ÉCH. ÉTAT RECUPE	COUPS/15cm RQD	W <sub>p</sub> W <sub>s</sub> W <sub>u</sub>
0.00	Niveau						
-0.15	Pierre de calcaire avec passées argileuses		C2-1				Is(a) = 2 MPa
0.15	Mortier, la chaux						
-0.18	Pierre de calcaire avec passées argileuses		C2-2				Is(a) = 2,5 MPa
0.18	Mortier, la chaux						
-0.43	Pierre de calcaire avec passées argileuses		C2-3				Is(a) = 1,9 MPa
0.43	Mortier, la chaux						
-0.61	Pierre de calcaire avec passées argileuses		C2-4				Is(a) = 3,8 MPa Is(d) = 4,4 Mpa
0.61	Mortier, la chaux						
-0.90	Pierre de calcaire avec passées argileuses		C2-5				Is(a) = 3,7 Mpa
0.90	Mortier, la chaux						
-0.93	Pierre de calcaire avec passées argileuses		C2-6				Is(a) = 2,5 MPa
0.93	Mortier, la chaux						
-1.36	Pierre de calcaire avec passées argileuses						
1.36	Mortier, la chaux						
-1.41	Pierre de calcaire avec passées argileuses						
1.41	Mortier, la chaux						
-3.66	FIN DE SONDAGE						
3.66							
Remarque(s):							
Vérifié par : Mohammad Hosseini Ing;Ph.D;Dr							
Date de production 2014-11-13							

RAPPORT DE SONDAGE				SONDAGE N° 14 C3						
Nom du projet : Carottage des murs de maçonnerie à Ford Lennox				N/D : F4-14-0925						
Nom du client : Dessau				V/D :						
Localisation : 61 <sup>ème</sup> avenue, St-Paul-De l'île-Aux-Noix Québec				Coordonnées géodésiques (NAD-1983 SCOPQ) X: Y: Z:						
Entrepreneur en forage:				Plan de localisation No. :						
Type de forage : Forage manuel				Date du début du forage : 2014-10-15						
Diamètre du forage:				Profondeur du forage : ( m). 3.61						
Technicien de chantier : Mohammad Hosseini				Réalisé par : Chafik, Bahloul.						
<b>TYPE D'ÉCHANTILLON</b> CF Cullière fendue TM Tube à paroi mince CR Carottage au diamant TA Tarière MA Manuel		<b>TERMINOLOGIE</b> "traces" 1-10% "un peu" 10-20% adjectif (...eux) 20-35% "et" 35-50%		<b>INDICE DE QUALITÉ DU ROC</b> % RQD QUALIFICATIF <25 Très mauvaise 25-50 Mauvaise 50-75 Moyenne 75-90 Bonne 90-100 Excellente						
<b>ÉTAT DE L'ÉCHANTILLON</b>  Remanié  Intact (tube à paroi mince)  Perdu  Forage au diamant		<b>SYMBOLES</b> N: Indice de pénétration standard R: Refus (N > 50) R.Q.D: Indice de qualité du roc (Rock Quality Designation) % R.Q.D = $\frac{L}{L_0} \times 100$ Carottes > 4 po. (10 cm) longueur forée		<b>COMPACTITÉ</b> Très lâche 0-4 Lâche 4-10 Compact 10-30 Dense 30-50 Très dense >50						
<b>CLASSIFICATION (SYSTÈME UNIFIÉ)</b> Argile < 0,002 mm Silt 0,002 à 0,075 mm Sable 0,075 à 4,75 mm Gravier 4,75 à 75 mm Cailloux 75 à 300 mm Blocs > 300mm		<b>CONSISTANCE DES SOLS COHÉRENTS</b> Très molle Molle Ferme Raide Très raide Dure		<b>INDICE "N"</b> Résistance au cisaillement (Cu) <12 kPa 12-25 kPa 25-50 kPa 50-100 kPa 100-200 kPa >200 kPa						
<b>NIVEAU D'EAU</b> Date: Prof.: Venue d'eau Niveau stabilisé de la nappe phréatique										
PROFONDEUR (m)	STRATIGRAPHIE		ÉCHANTILLONS				COUPS/15cm RQD	GRAPHIQUE	Niveau d'eau	ESSAIS
	PROF. - pi	NIVEAU (m)/ PROFONDEUR	DESCRIPTION DU SOL ET DU ROC	SYMBOLES	TYPE ÉCHANTILLON NO	SOUS-ÉCH.				
	0.00	Niveau								
	0.00	Pierre de calcaire avec passées argileuses		C3-1						Is(a) = 2,6 MPa
	-0.15	Mortier de sable carbonaté consolidée, très poreux		C3-2						
	-0.41	Mortier, la chaux		C3-3						
	-0.66	Pierre de calcaire avec passées argileuses		C3-4						Is(a) = 6,4 MPa Is(d) = 4,9 MPa
	1.37	Mortier, la chaux		C3-5						Is(d) = 6,4 MPa Is(a) = 6,1 MPa
	-1.62	Pierre de calcaire avec passées argileuses		C3-6						
	1.82	Mortier, la chaux		C3-7						Is(d) = 5,6 MPa Is(a) = 5,4 Mpa
	-2.19	Pierre de calcaire avec passées argileuses		C3-8						Is(a) = 4,4 Mpa
	2.19	Mortier, la chaux		C3-9						Is(a) = 5,7 Mpa
	-2.44	Pierre de calcaire avec passées argileuses		C3-10						Is(d) = 5,1 MPa
	2.44	Mortier, la chaux		C3-11						
	-3.61	FIN DE SONDAGE								
	3.61									
Remarque(s):										
Vérfié par : Mohammad Hosseini Ing.Ph.D;Dr										
Date de production 2014-11-13										




RAPPORT DE SONDAGE				SONDAGE N°					
Nom du projet : Carottage des murs de maçonnerie à Ford Lennox Nom du client : Dessau Localisation : 61 <sup>ème</sup> avenue, St-Paul-De l'île-Aux-Noix Québec Entrepreneur en forage : Type de forage : Forage manuel Diamètre du forage : Technicien de chantier : Mohammad Hosseini				N/D : F4-14-0925 V/D : Coordonnées géodésiques (NAD-1983 SCOPOQ) X: Y: Z: Plan de localisation No. : Date du début du forage : 2014-10-15 Profondeur du forage : ( m ). 2.80					
TYPE D'ÉCHANTILLON CF Cuillère fendue TM Tube à paroi mince CR Carottage au diamant TA Tarière MA Manuel		TERMINOLOGIE "traces" 1-10% "un peu" 10-20% adjectif (...eux) 20-35% "et" 35-50%		INDICE DE QUALITÉ DU ROC % RQD QUALIFICATIF <25 Très mauvaise 25-50 Mauvaise 50-75 Moyenne 75-90 Bonne 90-100 Excellente		COMPACTITÉ INDICE "N" Très lâche 0-4 Lâche 4-10 Compact 10-30 Dense 30-80 Très dense >80		NIVEAU D'EAU Date: Prof.:	
ÉTAT DE L'ÉCHANTILLON  Remanié  Intact (tube à paroi mince)  Perdu  Forage au diamant		SYMBOLES N: Indice de pénétration standard R: Refus (N > 50) R.Q.D: Indice de qualité du roc (Rock Quality Designation) % R.Q.D = $\frac{\sum \text{Carottes} > 4 \text{ po. (10 cm)}}{\text{longueur forée}}$		CLASSIFICATION (SYSTÈME UNIFIÉ) Argile < 0,002 mm Silt 0,002 à 0,075 mm Sable 0,075 à 4,75 mm Gravier 4,75 à 75 mm Cailloux 75 à 300 mm Blocs > 300mm		CONSISTANCE DES SOLS COHÉRENTS Très molle Molle Ferme Raide Très raide Duro		RÉSISTANCE AU CISAILEMENT (Cu) <12 kPa 12-25 kPa 25-50 kPa 50-100 kPa 100-200 kPa >200 kPa	
PROFONDEUR (m) PROF. - pi NIVEAU (m)/ PROFONDEUR		STRATIGRAPHIE DESCRIPTION DU SOL ET DU ROC		ÉCHANTILLONS TYPE ÉCHANTILLON NO SOUS-ÉCH. ÉTAT RECUPERATION % N, R ou RQD		GRAPHIQUE N (pen. standard) Nc (pen. dynamique) F : Cu (laboratoire) : Cu (chantier) : Cu (chantier) W <sub>p</sub> W <sub>n</sub> W <sub>c</sub> 20 40 60 80		ESSAIS AG : analyse granulométrique AC : analyse chimique WL : limite liquide Wp : limite plastique Wn : teneur en eau Rcc : compression du roc Cur : cisaillement remanié Cu : cisaillement non drainé Cc : coeff. de consolidation K : perméabilité Dup : éch. duplicata prélevé	
0.00 Niveau 0.00 Pierre de Calcaire avec passées argileuses -0.15 Mortier, la chaux 0.15 -0.20 Pierre de calcaire avec passées argileuses 0.20 1 Niveau -1.35 Mortier, la chaux 1.35 -1.38 Pierre de calcaire avec passées argileuses 1.38 5 Niveau -2.80 FIN DE SONDAGE 2.80		C4-1 C4-2 C4-3 C4-4 C4-5 C4-6 C4-7 C4-8		COUPS/15cm RQD		Niveau d'eau Is(a) = 3,1 MPa Is(a) = 3 MPa Is(a) = 2,5 MPa Is(a) = 5,9 MPa Is(d) = 3,1 MPa Is(d) = 4,5 MPa Is(d) = 4,5 MPa Is(a) = 4,5 MPa Is(d) = 4,5 MPa Is(a) = 5,7 MPa			
Remarque(s): Vérifié par : Mohammad Hosseini Ing,Ph.D;Dr Date de production 2014-11-13									

**CLIENT : DESSAU**  
Expertise géotechnique et de maçonnerie  
Fort-Lennox à St-Paul de l'île-aux-Noix (Québec)

12  
13 novembre 2014  
N/D : F4-14-0925

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**Annexe 4:**  
**Résultats des essais de laboratoire**

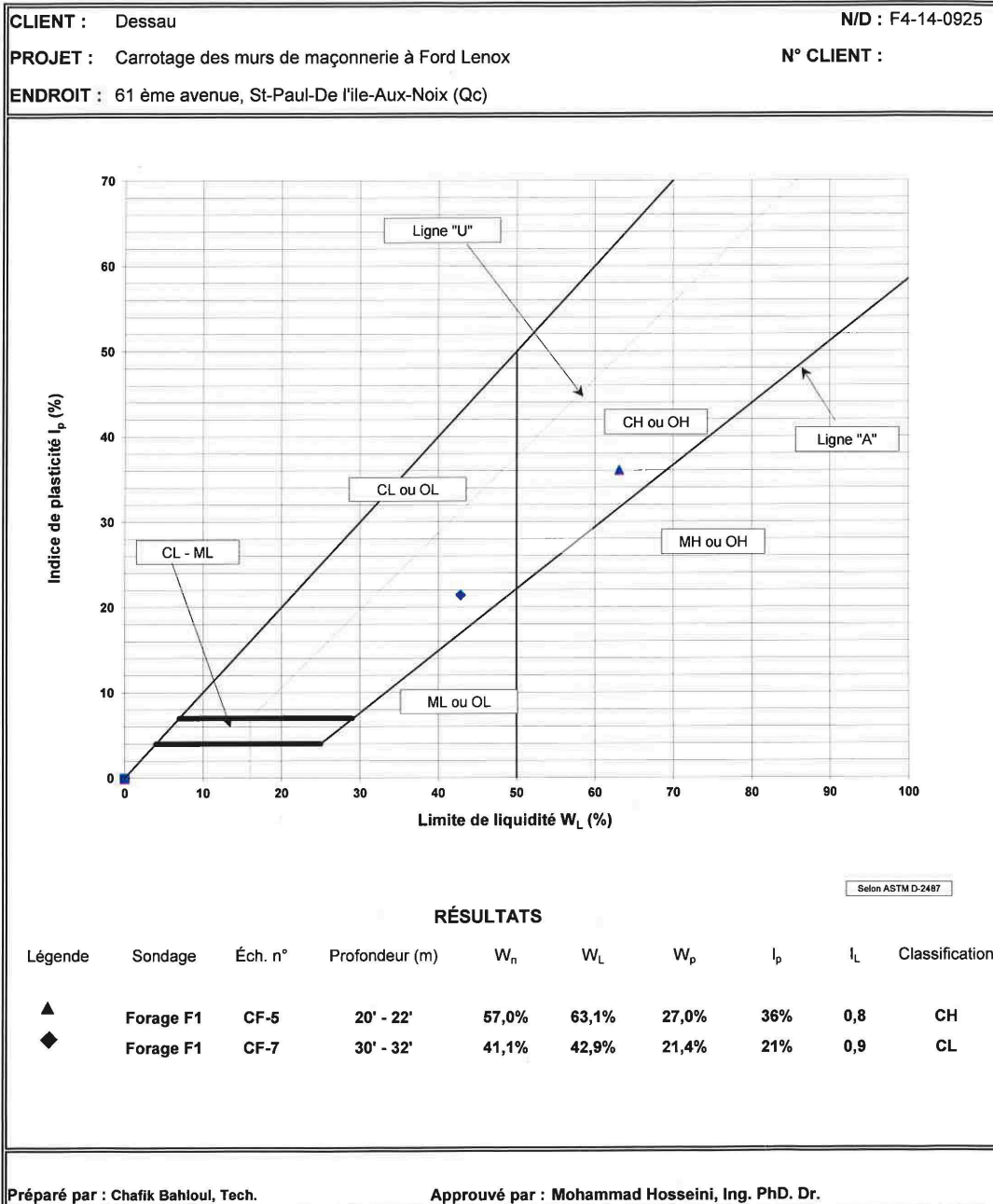
 <b>Fondasol</b> <small>Étude et expertise géotechnique Pathologie des fondations et des bâtiments Conception et consultation géotechnique</small>	<b>Formulaire de travail laboratoire</b>		NUMÉRO : LAB15			
			EN VIGUEUR LE : 15 MARS 2005			
			VERSION : 4			
<b>TITRE : Détermination de la teneur en eau par séchage</b>						
LC 21-201						
<b>Client :</b> Dessau		<b># Dossier :</b> F4-14-0925		<b># lab ABS :</b>		
<b>Projet :</b> Carottage des murs de maçonnerie à Ford Lenox		<b>Calculé par :</b> Chafik Bahloul, Tech.				
<b>Description du matériel :</b>		<b>Vérifié par :</b> Mohammad Hosseini, Ing. PhD. Dr.				
<b>Localisation :</b> 61 ème avenue, St-Paul-De l'île-Aux-Noix (Qc)			<b>Prélevé par :</b> M. H.			
<b>Provenance :</b>			<b>Date des travaux :</b>			
<b>Forage 14 F-01</b>						
No. Laboratoire	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>		
Échantillon	CF-5 20' - 22'	CF-6 25' - 27'	CF-7 30' - 32'	CF-8 35' - 37'		
1- Tare	4,6	4,6	4,7	4,4		
2- Sol humide + tare	91,6	96,0	116,3	93,3		
3- Sol sec + tare	60,0	62,5	83,8	69,3		
4- Masse de l'eau (2 - 3)	31,6	33,5	32,5	24,0		
5- Sol humide (2 - 1)	87,0	91,4	111,6	88,9		
6- Sol sec (3 - 1)	55,4	57,9	79,1	64,9		
7- Teneur en eau (%) ((5 - 6) / 6) x 100	<b>57,0</b>	<b>57,9</b>	<b>41,1</b>	<b>37,0</b>		
8- Teneur en eau à la sonde (%)	N/A	N/A	N/A	N/A		
<b>Remarques:</b>						



**Fondasol**


**ABAQUE DE PLASTICITÉ DES SOLS**


Étude et expertise géotechnique  
Pathologie des fondations et des bâtiments  
Conception et consultation géotechnique





N/Réf.: LO003 (R00 03-08-2010)




 <b>Fondasol</b> <small>Étude et expertise géotechnique Pathologie des fondations et des bâtiments Conception et consultation géotechnique</small>		<b>Protocole de Laboratoire</b>							
<b>TITRE : Essai de Poinçonnement</b>									
Client:	Dessau				# dossier:	F4-14-0925	# lab ABS:		
Projet:	Carrotage des murs de maçonnerie à Ford Lennox				calculé par:				
					vérifié par:				
Localisation:	61 ème avenue, St-Paul-De l'ile-Aux-Noix (Qc)				Prélevé par:				
Provenance:					Date:				
Échantillon		Longueur	Diamètre	P	P	A <sub>s</sub>	D <sub>e</sub> <sup>2</sup>	F	I <sub>s</sub>
		L (m)	D (m)	(PSI)	(KPa)	(m <sup>2</sup> )	D(m)	(KN)	(MPa)
F1 CR-9 (16,47 m)	axial	0,036	0,047	750	5171,25	0,001135	0,002155414	5,86936875	2,7
F1 CR-9 (17,07 m)	axial	0,033	0,047	850	5860,75	0,001135	0,001975796	6,65195125	3,4
F1 CR-9(17,68 m)	axial	0,038	0,047	750	5171,25	0,001135	0,002275159	5,86936875	2,6
F1 CR-10 (18,29 m)	axial	0,03	0,047	850	5860,75	0,001135	0,001796178	6,65195125	3,7
F1 CR-10(18,89 m)	axial	0,041	0,047	850	5860,75	0,001135	0,002454777	6,65195125	2,7
Remarques:									

 <b>Fondasol</b> <small>Étude et expertise géotechnique Pathologie des fondations et des bâtiments Conception et consultation géotechnique</small>		<b>Protocole de Laboratoire</b>								
<b>TITRE : Essai de Poinçonnement</b>										
Client:	Dessau				# dossier:	F4-14-0925		# lab ABS:		
Projet:	Carottage des murs de maçonnerie à Ford Lennox				calculé par:					
					vérifié par:					
Localisation:	61 ème avenue, St-Paul-De l'ile-Aux-Noix (Qc)				Prélevé par:					
Provenance:					Date:					
Échantillon		Longueur	Diamètre	P	P	A <sub>s</sub>	D <sub>e</sub> <sup>2</sup>	F	I <sub>s</sub>	
		L (m)	D (m)	(PSI)	(KPa)	(m <sup>2</sup> )	D(m)	(KN)	(MPa)	
C1-1 (0 m)	axial	0,065	0,093	3250	22408,75	0,001135	0,007700637	25,4339313	3,3	
C1-3 (0,60 m)	axial	0,032	0,04	1050	7239,75	0,001135	0,001630573	8,21711625	5,0	
C1-6 (2,13 m)	axial	0,032	0,04	300	2068,5	0,001135	0,001630573	2,3477475	1,4	
C1-6 (2,23 m)	axial	0,037	0,04	1150	7929,25	0,001135	0,00188535	8,99969875	4,8	
C1-7 (3,05 m)	axial	0,033	0,04	1500	10342,5	0,001135	0,001681529	11,7387375	7,0	
C1-4 (0,9 m)	Radial	0,05	0,04	1150	7929,25	0,001135	0,0016	8,99969875	5,6	
C1-5 (1,88 m)	Radial	0,06	0,04	950	6550,25	0,001135	0,0016	7,43453375	4,6	
C1-7 (3,20 m)	Radial	0,11	0,04	1450	9997,75	0,001135	0,0016	11,3474463	7,1	
C1-7 (3,10 m)	Radial	0,06	0,04	1450	9997,75	0,001135	0,0016	11,3474463	7,1	
Remarques:										

 <b>Fondasol</b> <small>Étude et expertise géotechnique Pathologie des fondations et des bâtiments Conception et consultation géotechnique</small>		<b>Protocole de Laboratoire</b>							
<b>TITRE : Essai de Poinçonnement</b>									
Client:	Dessau				# dossier:	F4-14-0925	# lab ABS:		
Projet:	Carottage des murs de maçonnerie à Ford Lennox				calculé par:				
					vérifié par:				
Localisation:	61 ème avenue, St-Paul-De l'île-Aux-Noix (Qc)				Prélevé par:				
Provenance:					Date:				
Échantillon		Longueur	Diamètre	P	P	A <sub>s</sub>	D <sub>e</sub> <sup>2</sup>	F	I <sub>s</sub>
		L (m)	D (m)	(PSI)	(KPa)	(m <sup>2</sup> )	D(m)	(KN)	(MPa)
C2-1 (0 m)	axial	0,062	0,095	1950	13445,25	0,001135	0,007503185	15,2603588	2,0
C2-3 (0,61 m)	axial	0,05	0,05	1000	6895	0,001135	0,003184713	7,825825	2,5
C2-4 (0,96 m)	axial	0,055	0,058	1000	6895	0,001135	0,004063694	7,825825	1,9
C2-4 (1,52 m)	axial	0,055	0,06	2050	14134,75	0,001135	0,004203822	16,0429413	3,8
C2-5 (2,74 m)	axial	0,05	0,05	1000	6895	0,001135	0,003184713	7,825825	2,5
C2-3 (1,21 m)	Radial	0,07	0,058	1700	11721,5	0,001135	0,003364	13,3039025	4,0
C2-5 (1,55 m)	Radial	0,09	0,058	1900	13100,5	0,001135	0,003364	14,8690675	4,4
C2-5 (1,73 m)	Radial	0,075	0,058	1600	11032	0,001135	0,003364	12,52132	3,7
Remarques:									

 <b>Fondasol</b> <small>Étude et expertise géotechnique Pathologie des fondations et des bâtiments Conception et consultation géotechnique</small>		<b>Protocole de Laboratoire</b>							
<b>TITRE : Essai de Poinçonnement</b>									
Client:	Dessau				# dossier:	F4-14-0925	# lab ABS:		
Projet:	Carrotage des murs de maçonnerie à Ford Lennox				calculé par:				
					vérifié par:				
Localisation:	61 ème avenue, St-Paul-De l'île-Aux-Noix (Qc)				Prélevé par:				
Provenance:					Date:				
Échantillon		Longueur	Diamètre	P	P	A <sub>s</sub>	D <sub>e</sub> <sup>2</sup>	F	I <sub>s</sub>
		L (m)	D (m)	(PSI)	(KPa)	(m <sup>2</sup> )	D(m)	(KN)	(MPa)
C3-1 (0 m)	axial	0,052	0,092	2000	13790	0,001135	0,006094268	15,65165	2,6
C3-5 (0,91 m)	axial	0,035	0,04	1450	9997,75	0,001135	0,001783439	11,3474463	6,4
C3-6 (1,27 m)	axial	0,035	0,04	1400	9653	0,001135	0,001783439	10,956155	6,1
C3-9 (1,9 m)	axial	0,039	0,04	1375	9480,625	0,001135	0,001987261	10,7605094	5,4
C3-10(2,60 m)	axial	0,04	0,04	1150	7929,25	0,001135	0,002038217	8,99969875	4,4
C3-11 (3,05 m)	axial	0,04	0,04	1500	10342,5	0,001135	0,002038217	11,7387375	5,8
C3-5 (0,96 m)	Radial	0,065	0,04	1000	6895	0,001135	0,0016	7,825825	4,9
C3-6 (1,22 m)	Radial	0,01	0,04	1300	8963,5	0,001135	0,0016	10,1735725	6,4
C3-9 (1,83 m)	Radial	0,06	0,04	1150	7929,25	0,001135	0,0016	8,99969875	5,6
C3-11 (3,40 m)	Radial	0,065	0,04	1050	7239,75	0,001135	0,0016	8,21711625	5,1
Remarques:									

		<b>Protocole de Laboratoire</b>							
<b>TITRE : Essai de Poinçonnement</b>									
Client:	Dessau				# dossier:	F4-14-0925	# lab ABS:		
Projet:	Carottage des murs de maçonnerie à Ford Lennox				calculé par:				
					vérifié par:				
Localisation:	61 ème avenue, St-Paul-De l'île-Aux-Noix (Qc)				Prélevé par:				
Provenance:					Date:				
Échantillon		Longueur	Diamètre	P	P	A <sub>s</sub>	D <sub>e</sub> <sup>2</sup>	F	I <sub>s</sub>
		L (m)	D (m)	(PSI)	(KPa)	(m <sup>2</sup> )	D(m)	(KN)	(MPa)
C4-1 (0 m)	axial	0,05	0,092	2350	16203,25	0,001135	0,005859873	18,3906888	3,1
C4-4 (0,74 m)	axial	0,052	0,095	2450	16892,75	0,001135	0,006292994	19,1732713	3,0
C4-5 (1,07 m)	axial	0,065	0,095	2500	17237,5	0,001135	0,007866242	19,5645625	2,5
C4-5 (1,26 m)	axial	0,035	0,055	1850	12755,75	0,001135	0,002452229	14,4777763	5,9
C4-6 (2 m)	axial	0,03	0,05	1100	7584,5	0,001135	0,001910828	8,6084075	4,5
C4-7 (2,5 m)	axial	0,025	0,06	1400	9653	0,001135	0,001910828	10,956155	5,7
C4-6 (1,7m)	Radial	0,99	0,058	1350	9308,25	0,001135	0,003364	10,5648638	3,1
C4-7 (1,8 m)	Radial	0,07	0,058	1950	13445,25	0,001135	0,003364	15,2603588	4,5
C4-7 (1,9m)	Radial	0,065	0,058	1950	13445,25	0,001135	0,003364	15,2603588	4,5
C4-7 (2,3 m)	Radial	0,062	0,058	1950	13445,25	0,001135	0,003364	15,2603588	4,5
Remarques:									

**CLIENT : DESSAU**  
Expertise géotechnique et de maçonnerie  
Fort-Lennox à St-Paul de l'île-aux-Noix (Québec)

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**Annexe 5:**  
**Relevé photographique**



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Photo 1



Photo 2

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Photo 3

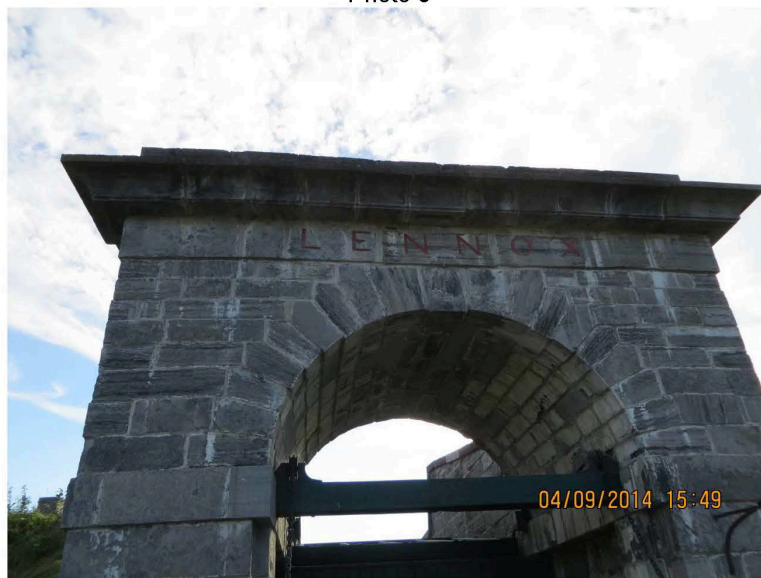


Photo 4



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Fort-Lennox à St-Paul de l'île-aux-Noix (Québec)

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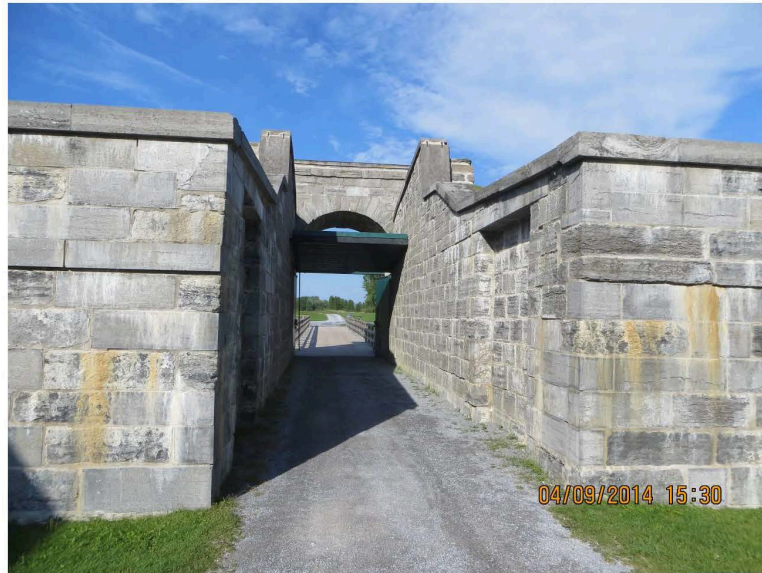


Photo 5

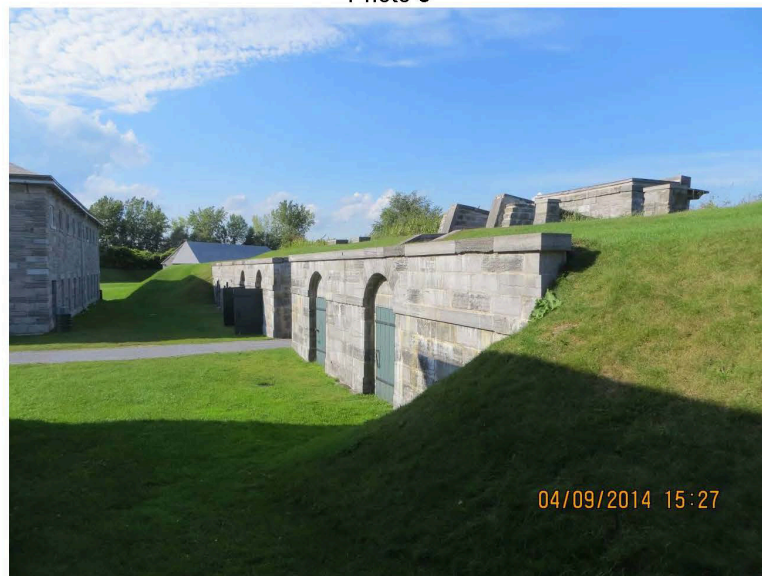


Photo 6

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Photo 7



Photo 8



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Photo 9



Photo 10

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Photo 11



Photo 12



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Photo 13



Photo 14

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Photo 15

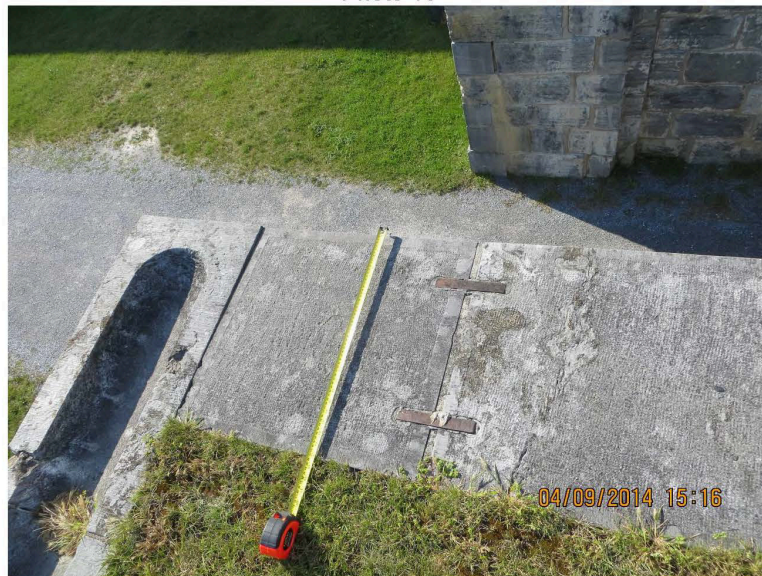


Photo 16



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Photo 17



Photo 18

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Photo 19



Photo 20



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Photo 21



Photo 22

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Photo 23



Photo 24



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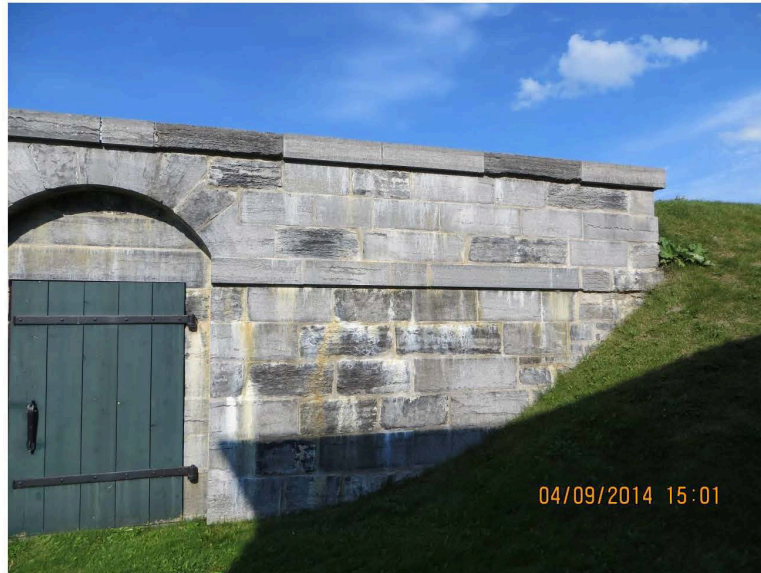


Photo 25



Photo 26

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Photo 27



Photo 28



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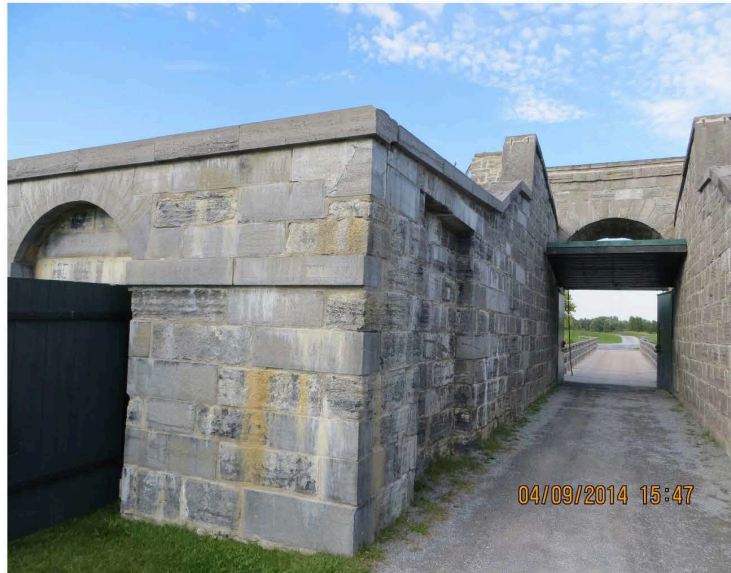


Photo 29

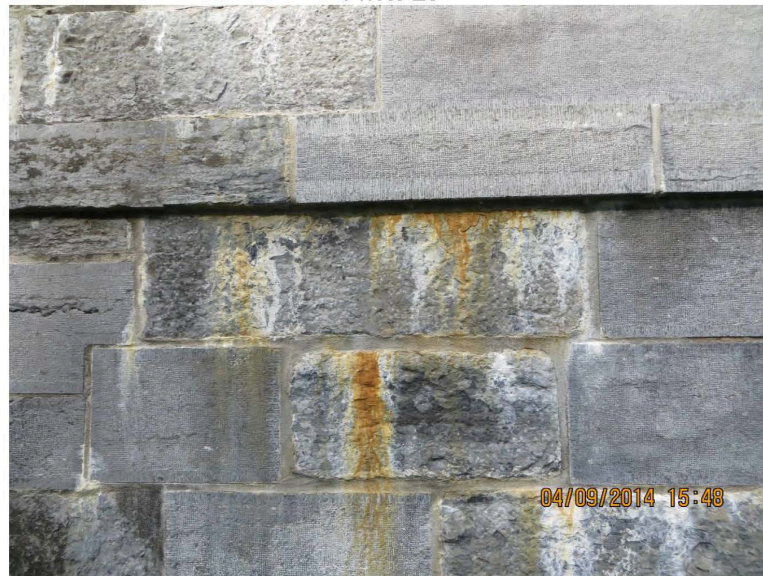


Photo 30

**CLIENT : DESSAU**  
Expertise géotechnique et de maçonnerie  
Fort-Lennox à St-Paul de l'île-aux-Noix (Québec)

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Photo 31

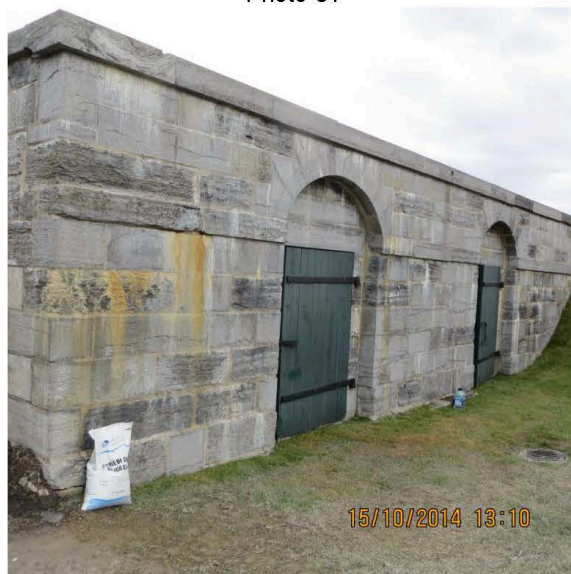


Photo 32

**CLIENT : DESSAU**  
Expertise géotechnique et de maçonnerie  
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Photo 33



Photo 34



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Photo 35



Photo 36



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Photo 37

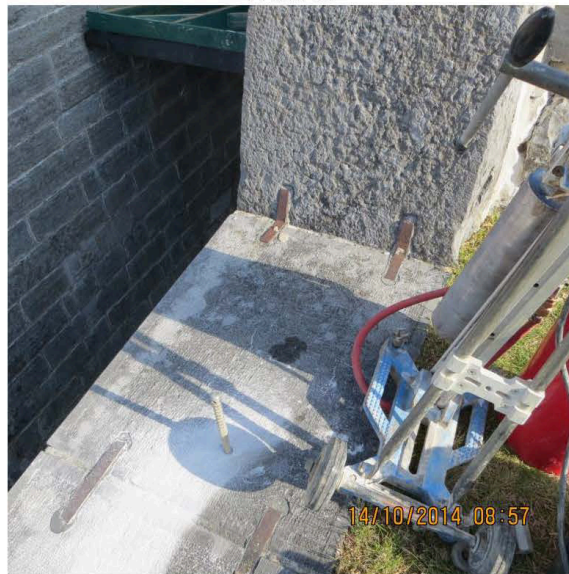


Photo 38

**CLIENT : DESSAU**  
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Photo 39



Photo 40

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Photo 41

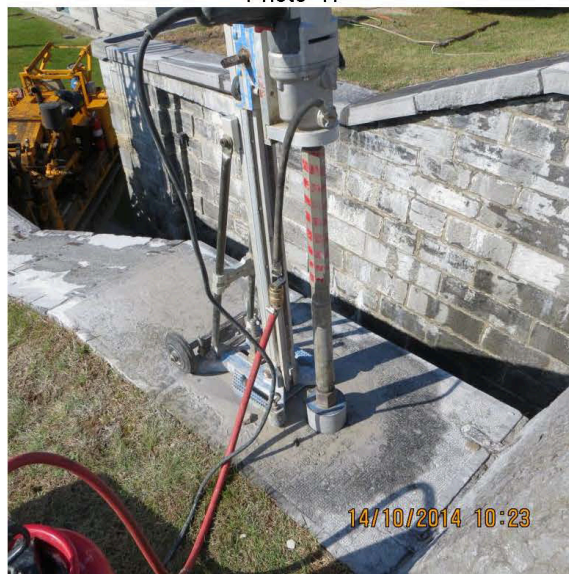


Photo 42



**CLIENT : DESSAU**  
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Photo 43



Photo 44

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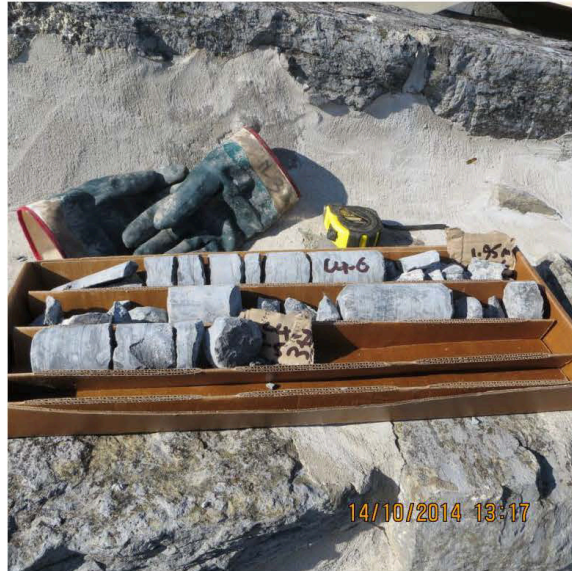


Photo 47



Photo 48



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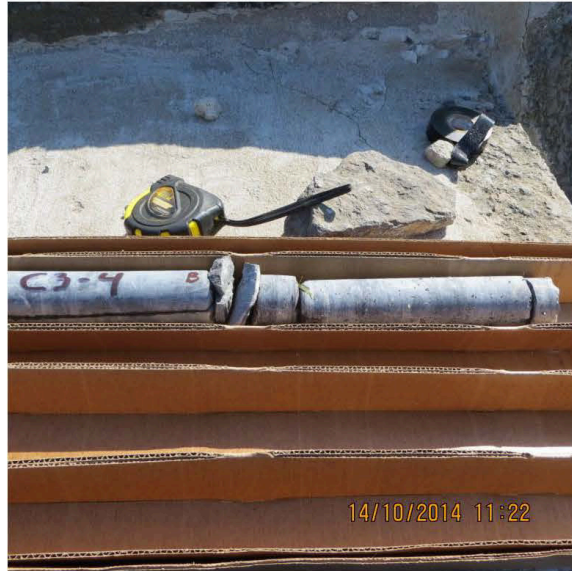


Photo 51



Photo 52



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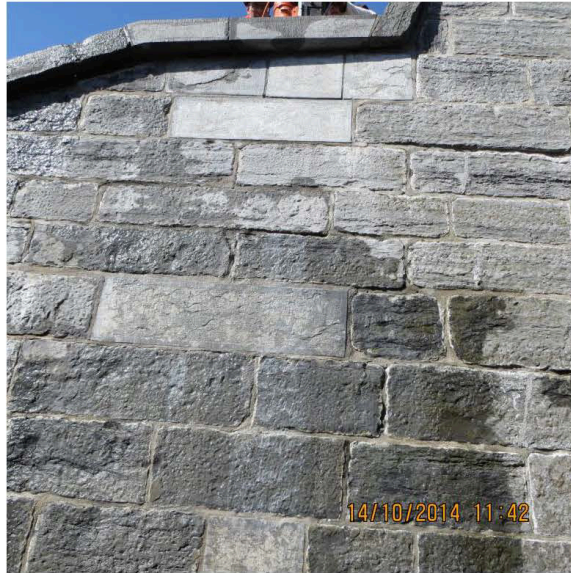


Photo 53

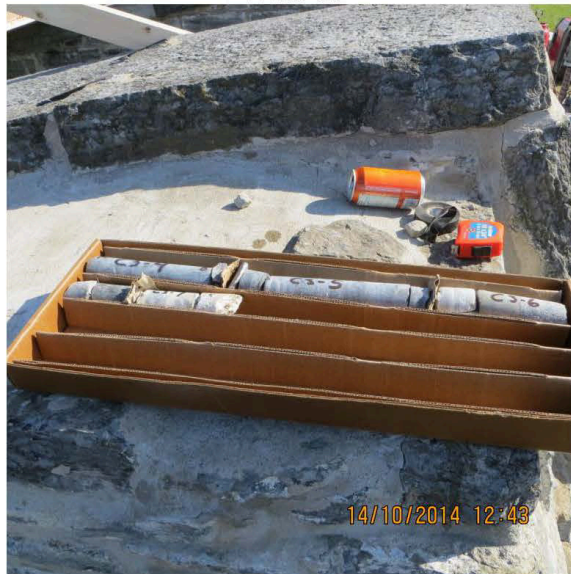


Photo 54

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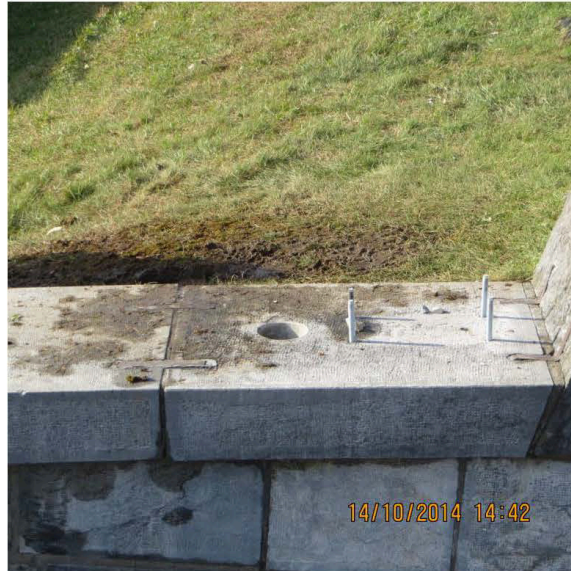


Photo 57



Photo 58



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Photo 59

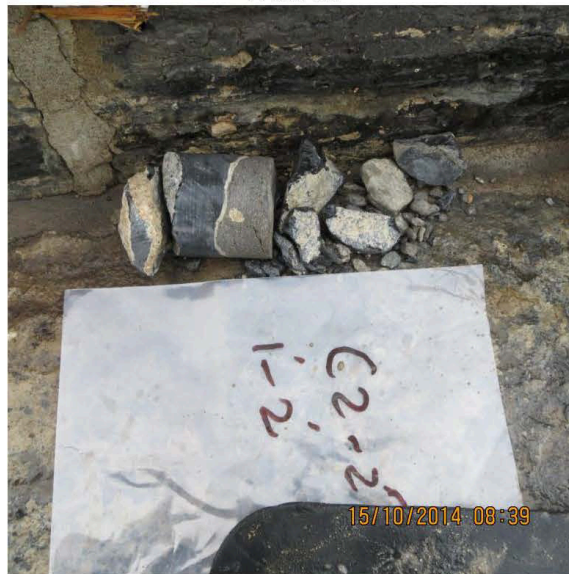


Photo 60

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Photo 63



Photo 64



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Photo 65

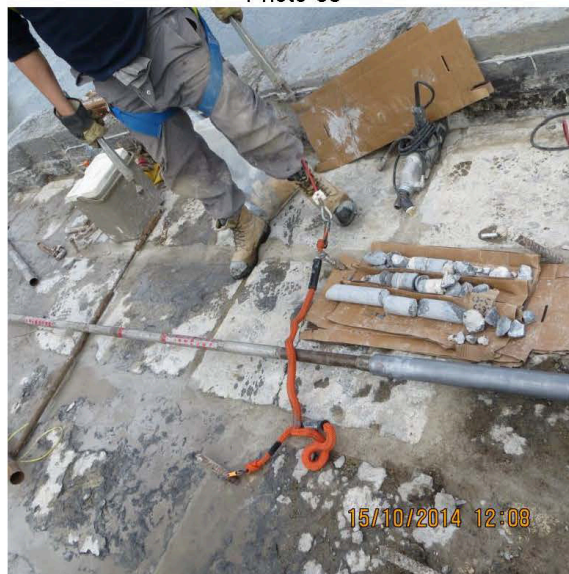


Photo 66

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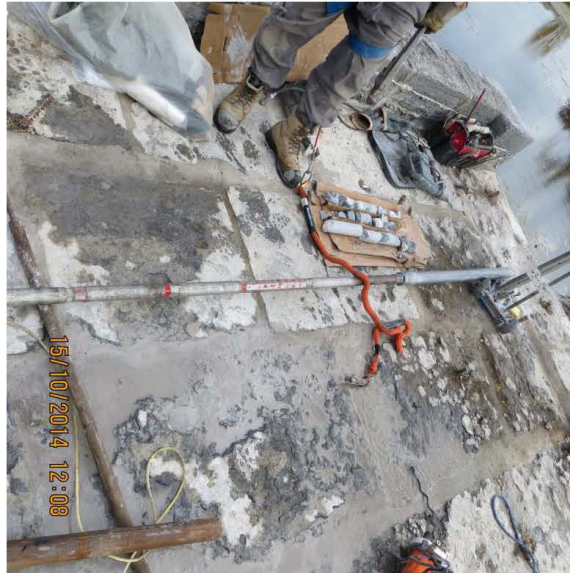


Photo 67



Photo 68



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Photo 69



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Photo 71



Photo 72

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Photo 73



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Photo 75

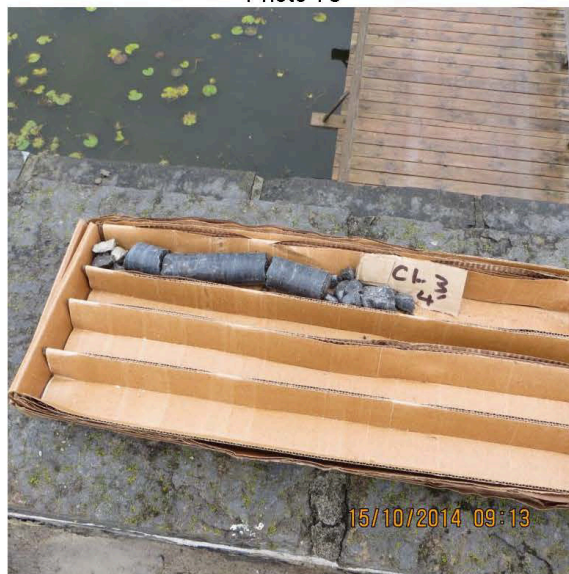


Photo 76

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Photo 79

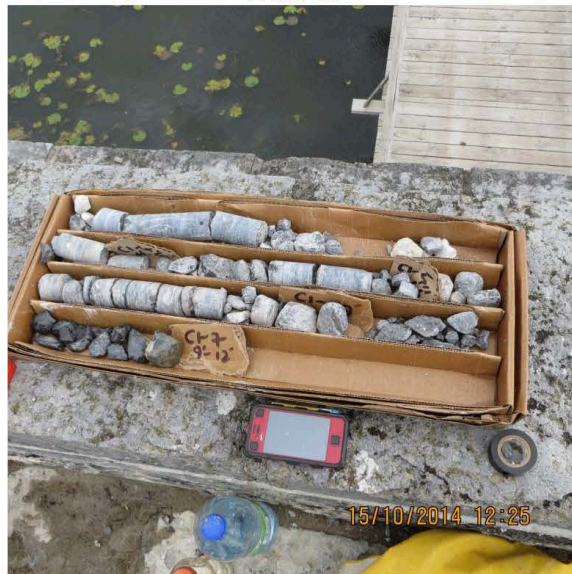


Photo 80



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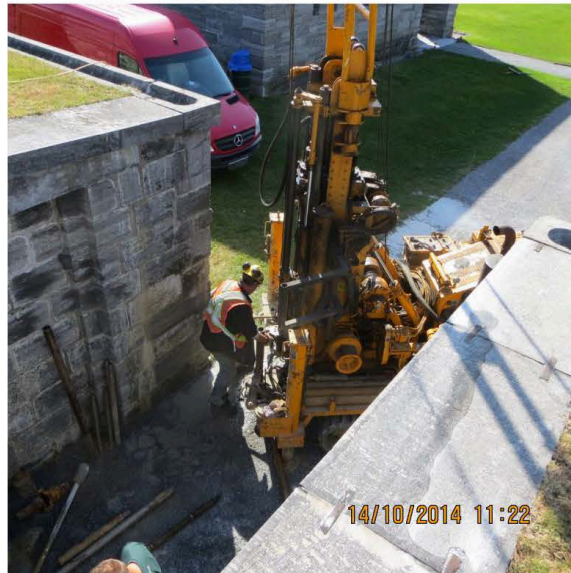


Photo 87



Photo 88

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Photo 94



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Photo 96

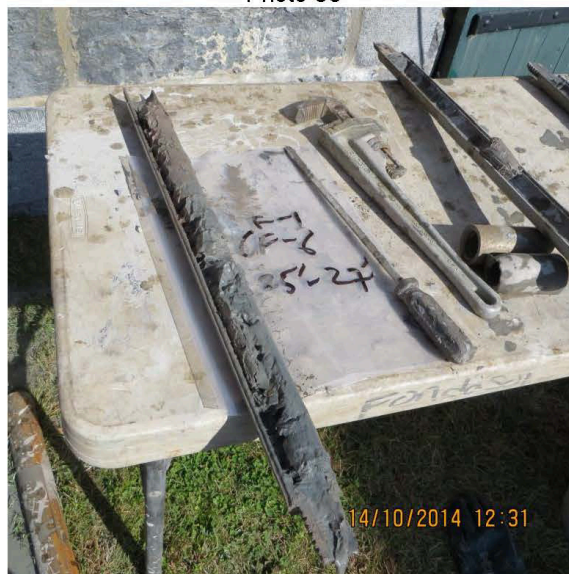


Photo 97

**CLIENT : DESSAU**  
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Photo 98



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Photo 100



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Photo 102

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Photo 103



Photo 104



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Photo 105

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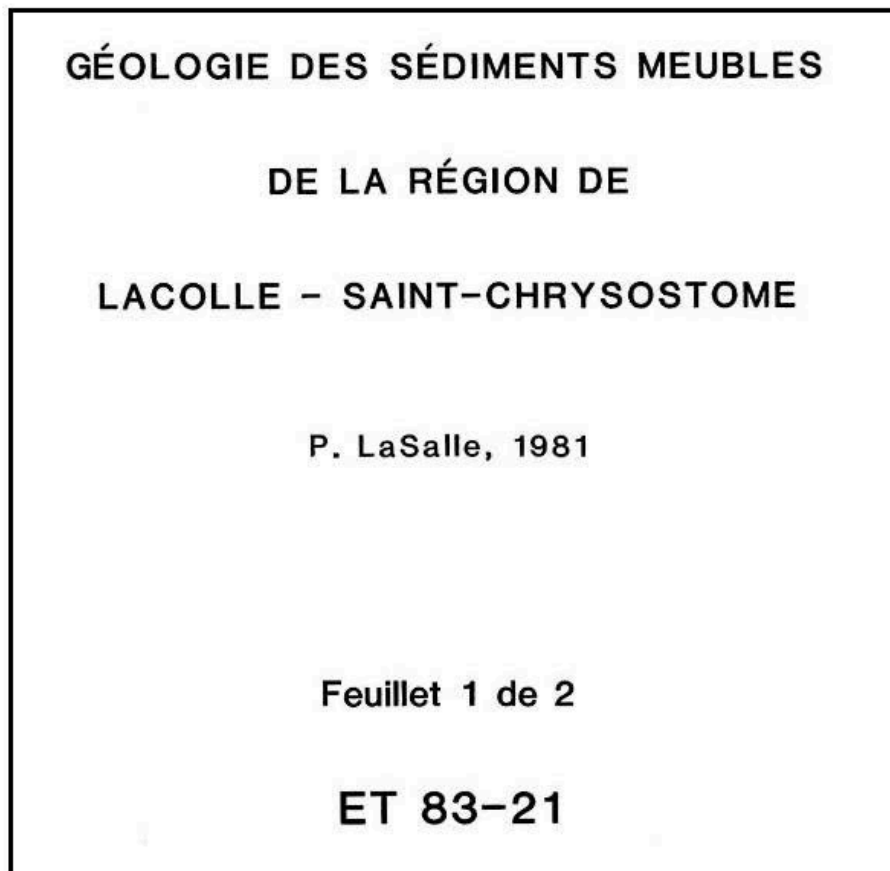
**68**  
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**Annexe 6:**  
**Extraits des cartes de sol consultées**

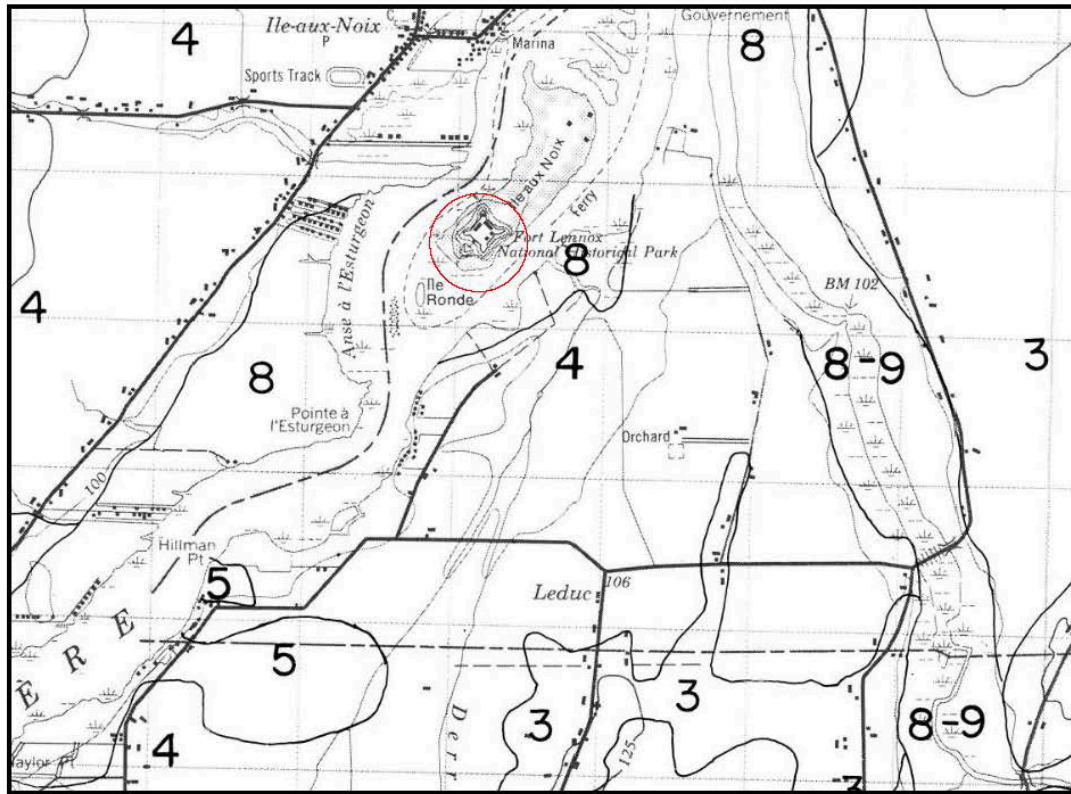
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Extrait de la carte de sol consultée

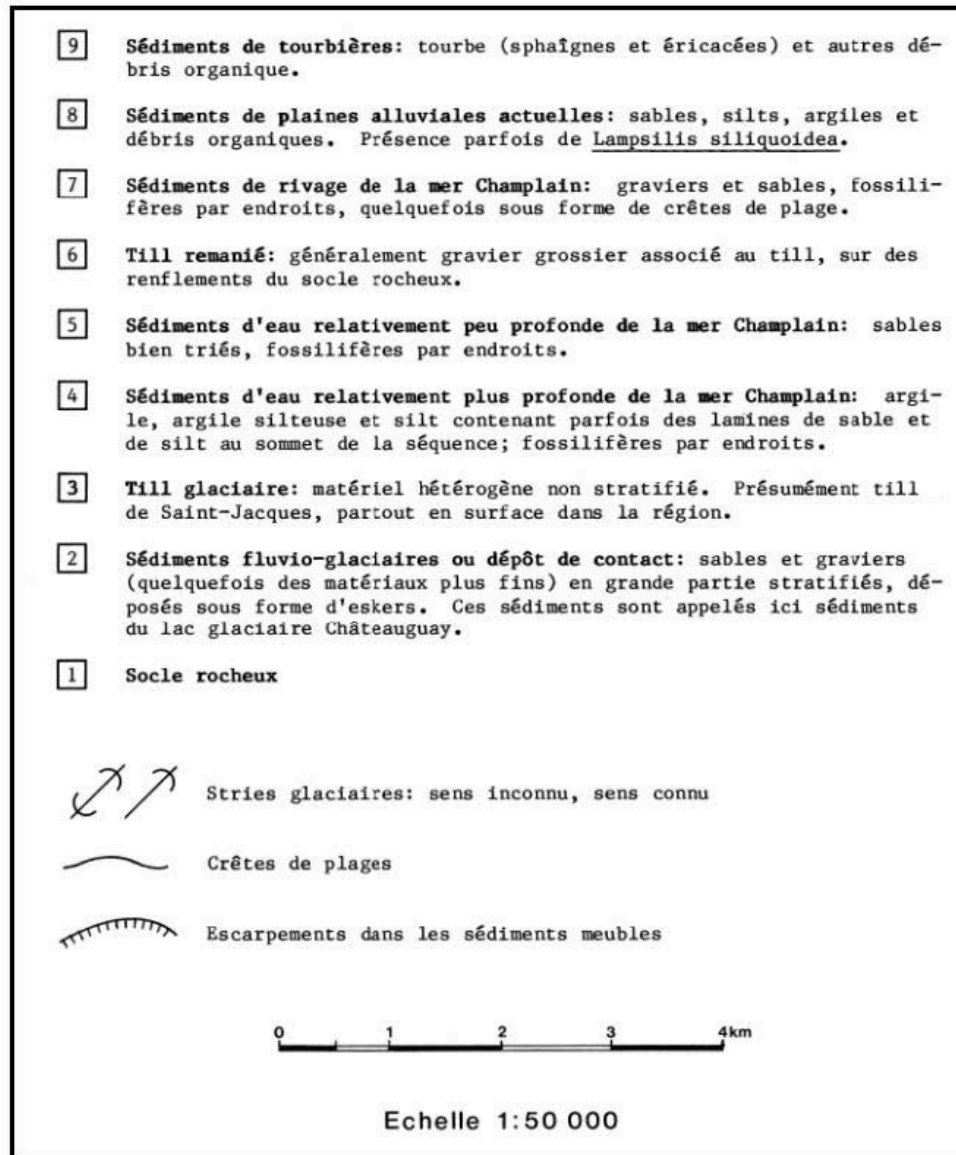


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**TABLEAU 1 - Sommaire des formations.**

	HOLOCÈNE		Dépôts de tourbières: tourbe à sphaignes et à éricacées
QUATERNAIRE	PLÉISTOCÈNE	WISCONSIN	Sédiments des basses terrasses: sables, silts, argiles et matière organique
			Sédiments de la mer Champlain
			- sables et graviers littoraux - till remanié (gravier) - sédiments fluvio-glaciaire remaniés (surtout sable et gravier) - sédiments d'eau peu profonde - argiles marines
			Sédiments du lac pro-glaciaire Chambly: argiles et silts varvés
			Till de Saint-Jacques
			Sédiments du lac pro-glaciaire Châteauguay: graviers, sables et sédiments varvés de la formation de Châteauguay
			Till (?)
			-----discordance-----
TERtiaIRE	Longue période d'érosion et établissement du système de drainage des Basses Terres du Saint-Laurent (sens large)		

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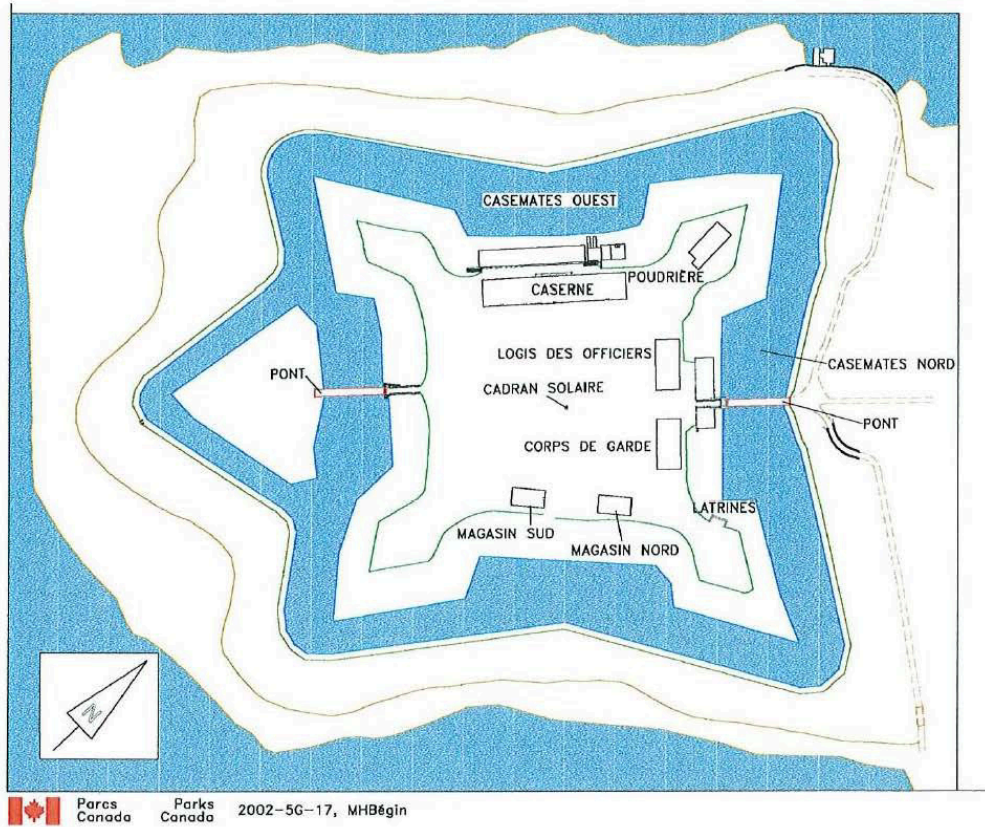
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**Annexe 7:**  
**Extraits des plans et documents consultés**

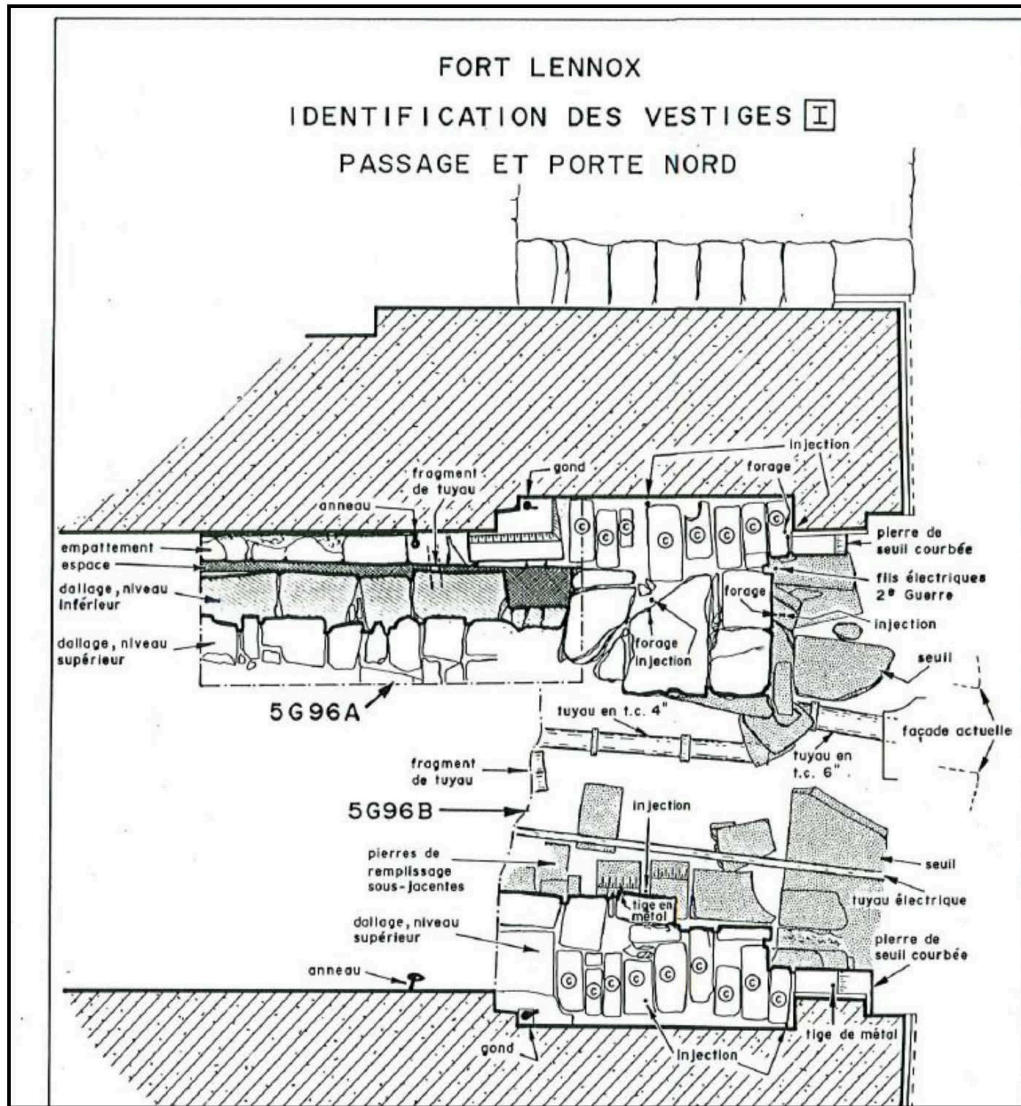
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Expertise géotechnique et de maçonnerie  
Fort-Lennox à St-Paul de l'île-aux-Noix (Québec)

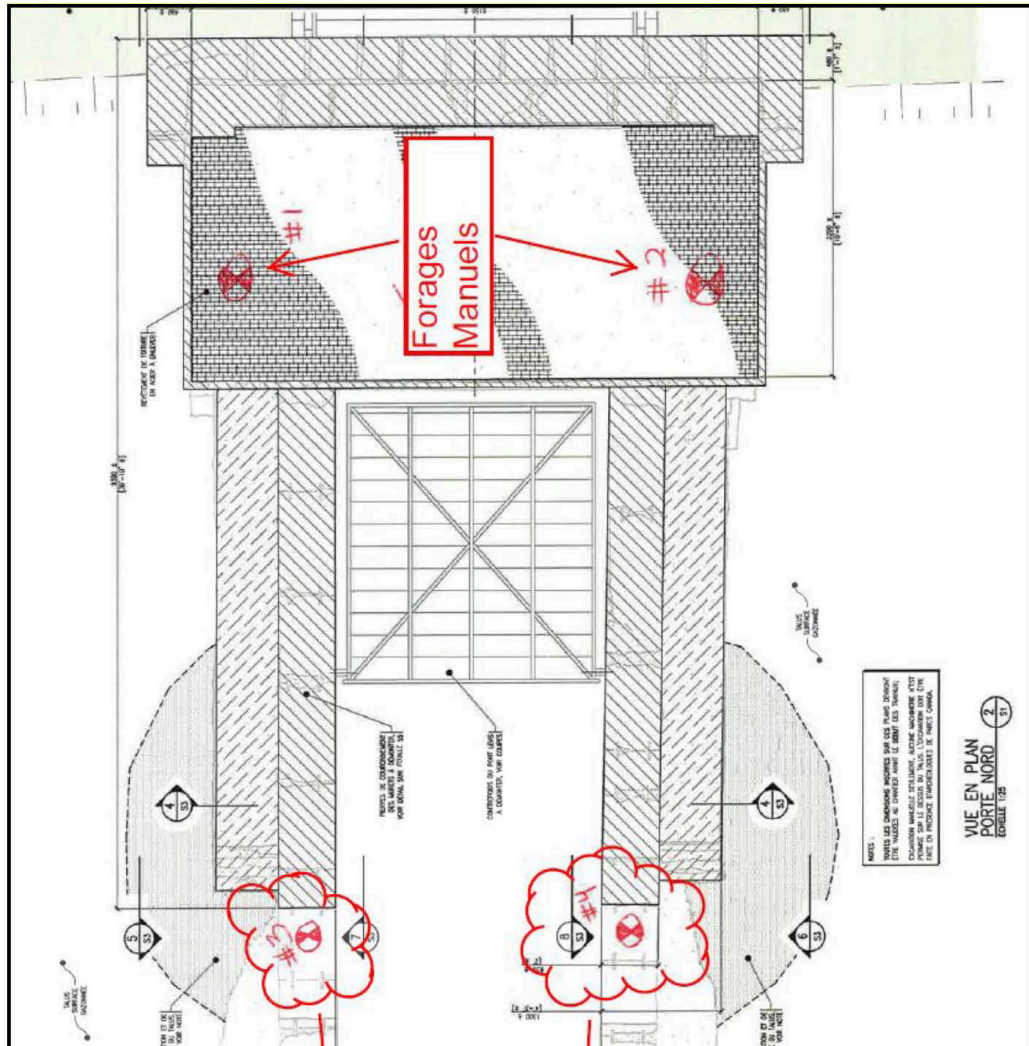
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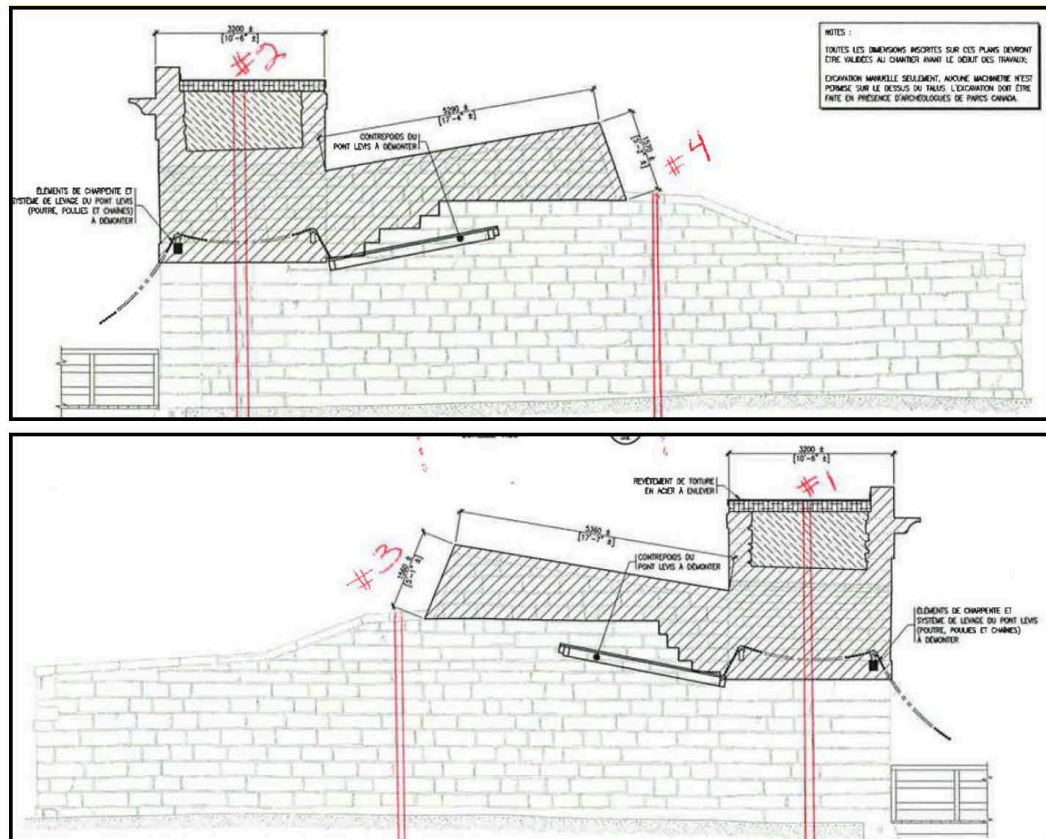
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END OF SECTION



**Part 1        General**

**1.1            RELATED REQUIREMENTS**

- .1        Section 31 23 33.01 – EXCAVATING, TRENCHING AND BACKFILLING

**1.2            REFERENCES**

- .1        ASTM International
  - .1        ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2        ASTM D4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .3        ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .4        ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
  - .5        ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2        Canadian General Standards Board (ONGB or CGSB)
  - .1        CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
  - .2        CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
    - .1        No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
    - .2        No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
    - .3        No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
    - .4        No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
    - .5        No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3        CSA International
  - .1        CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports:
  - .1 Submit copies of mill test data and certificate at least two (2) weeks prior to start of Work.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect geotextiles from direct sunlight and UV rays.
  - .3 Replace defective or damaged materials with new.

### **Part 2 Products**

#### **2.1 MATERIAL**

- .1 Geotextiles: fabrics of woven or nonwoven synthetic fibers, supplied in rolls. Geotextiles must be Type III according to Ministry of Transport of Quebec standard 13101. Physical and hydraulic properties of the standard 13101 must be met; the standard can be found in Volume VII of road works standards.
- .2 Securing pins and washers: to CSA G40.21, Grade 300 W, hot-dipped galvanized with minimum zinc coating of 600 g/m<sup>2</sup> to ASTM A123/A123M.
- .3 Factory seams: sewn in accordance with manufacturer's recommendations.
- .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of the Consultant.
  - .2 Inform the Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.

### **3.2 INSTALLATION**

- .1 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .2 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .3 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .4 Join successive strips of geotextile by sewing.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 After installation, cover with overlying layer within 4 hours of placement.
- .7 Replace damaged or deteriorated geotextile to approval of the Consultant.
- .8 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **3.3 CLEANING**

- .1 Leave Work area clean at end of each day.

### **3.4 PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 32 92 23 – Sodding
- .2        Section 32 93 10 – Trees, shrubs and ground cover planting

**Part 2            Products**

**2.1                TOPSOIL**

- .1        Topsoil for seeded areas and planting beds : mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
  - .1        Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
  - .2        Contain no toxic elements or growth inhibiting materials.
  - .3        Finished surface free from:
    - .1        Debris and stones over 50 mm diameter.
    - .2        Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .4        Consistence: friable when moist.

**2.2                SOIL AMENDMENTS**

- .1        Fertilizer:
  - .1        Fertility: major soil nutrients present in following amounts:
  - .2        Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
  - .3        Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
  - .4        Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
  - .5        Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
  - .6        Ph value: 6.5 to 8.0.

**2.3                SOURCE QUALITY CONTROL**

- .1        Advise Site Supervisor of sources of topsoil to be utilized with sufficient lead time for testing.
- .2        Contractor is responsible for amendments to supply topsoil as specified.
- .3        Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4        Testing of topsoil will be carried out by testing laboratory designated by Site Supervisor. Soil sampling, testing and analysis to be in accordance with Provincial standards.

**Part 3 Execution**

**3.1 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile in locations as indicated. Stockpile height not to exceed 2 m.
- .4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill off site.

**3.2 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct.
  - .1 If discrepancies occur, notify Site Supervisor and do not commence work until instructed by Site Supervisor.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
  - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
  - .2 Remove debris which protrudes more than 75 mm above surface.
  - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
  - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

**3.3 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after Site Supervisor has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.

**3.4 SOIL AMENDMENTS**

- .1 For turf : apply and thoroughly mix soil amendments into full specified depth of topsoil.

**3.5 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.

**3.6 ACCEPTANCE**

- .1 Site Supervisor will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

**3.7 SURPLUS MATERIAL**

- .1 Dispose of materials except topsoil not required off site.

**3.8 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

**Part 1           General**

**1.1               RELATED REQUIREMENTS**

- .1           Section 32 91 19.13 – Topsoil, Placement and Grading

**Part 2           Products**

**2.1               MATERIALS**

- .1           Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
  - .1           Turf Grass Nursery Sod types: Number One Kentucky Bluegrass Sod: Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
    - .1           Number One Named Cultivars: Nursery Sod grown from certified seed.
  - .2           Turf Grass Nursery Sod quality:
    - .1           Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
    - .2           Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
    - .3           Mowing height limit: 35 to 65 mm.
    - .4           Soil portion of sod: 6 to 15 mm in thickness.
- .2           Sod establishment support: Wooden pegs: [17 x 8 x 200] mm.
- .3           Fertilizer:
  - .1           To Canada "Fertilizers Act" and Fertilizers Regulations.
  - .2           Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

**2.2               SOURCE QUALITY CONTROL**

- .1           When proposed source of sod is approved, use no other source without written authorization from Site Supervisor.

**Part 3           Execution**

**3.1               EXAMINATION**

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



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### **3.2 PREPARATION**

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Site Supervisor and commence work when instructed by Site Supervisor.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade.
- .4 Remove and dispose of weeds, debris and stones 50 mm in diameter and larger, soil contaminated by oil, gasoline and other deleterious materials, off site.

### **3.3 SOD PLACEMENT**

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.
- .2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

### **3.4 SOD PLACEMENT ON SLOPES AND PEGGING**

- .1 Start laying sod at bottom of slopes.
- .2 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:
  - .1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.
  - .2 Not less than 3-6 pegs per square metre.
  - .3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Site Supervisor.
  - .4 Drive pegs to 20 mm above soil surface of sod sections.

### **3.5 PROTECTION BARRIERS**

- .1 Protect newly sodded areas from deterioration with [snow fence on rigid frame] as directed by Site Supervisor.
- .2 Remove protection 2 weeks after installation.

### **3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of installation until acceptance.
  - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
  - .2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.
  - .3 Maintain sodded areas weed free 95%.

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- .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
  - .5 Temporary barriers or signage to be maintained where required to protect newly established sod.

### **3.7 ACCEPTANCE**

- .1 Turf Grass Nursery Sod areas will be accepted by Site Supervisor provided that:
  - .1 Sodded areas are properly established.
  - .2 Sod is free of bare and dead spots.
  - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
  - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

### **3.8 MAINTENANCE DURING WARRANTY PERIOD**

- .1 Perform following operations from time of acceptance until end of warranty period: Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
- .2 Repair and resod dead or bare spots.
- .3 Cut grass and remove clippings that will smother grass as follows:
  - .1 Turf Grass Nursery Sod: 50 mm during normal growing conditions.
  - .2 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
  - .3 Eliminate weeds by mechanical means.

**END OF SECTION**

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Approved: 2011-06-30

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 32 91 19.13 – Topsoil placement and grading.

**Part 2            Products**

**2.1                PLANT MATERIAL**

- .1            Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

**2.2                WATER**

- .1            Free of impurities that would inhibit plant growth.

**Part 3            Execution**

**3.1                EXCAVATION AND PREPARATION OF PLANTING BEDS**

- .1            Establishment of sub-grade for planting beds in accordance plans.
- .2            Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .3            For individual planting holes:
  - .1            Stake out location and obtain approval from Site Supervisor prior to excavating.
  - .2            Excavate to depth and width as indicated.

**3.2                PLANTING**

- .1            For bare root stock, place 50 mm backfill soil in bottom of hole.
  - .1            Plant trees and shrubs with roots placed straight out in hole.
- .2            For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
  - .1            Do not pull burlap or rope from under root ball.
- .3            For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4            Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- .5            For trees and shrubs:
  - .1            Backfill soil in 150 mm lifts.
    - .1            Tamp each lift to eliminate air pockets.

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- .2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
  - .3 After water has penetrated into soil, backfill to finish grade.
  - .2 Form watering saucer as indicated.
  - .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
  - .7 Water plant material thoroughly.
  - .8 After soil settlement has occurred, fill with soil to finish grade.

### **3.3 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following maintenance operations from time of planting to acceptance by Site Supervisor.
  - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
    - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
    - .2 Remove weeds.
    - .3 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations
    - .4 Remove dead or broken branches from plant material.
    - .5 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

### **3.4 MAINTENANCE DURING WARRANTY PERIOD**

- .1 From time of acceptance by Site Supervisor to end of warranty period, perform following maintenance operations.
  - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
  - .2 Reform damaged watering saucers.
  - .3 Remove weeds .
  - .4 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations.
  - .5 Remove dead, broken or hazardous branches from plant material.
  - .6 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

### **3.5 CLOSEOUT ACTIVITIES**

- .1 Submit maintenance reports for trees, shrubs, and other plantings.

**END OF SECTION**