

# **REHABILITATION OF THE RIGHT AND LEFT SIDES OF THE SAINT-LOUIS BASTION**

**TPSGC Reference: R.081006.001**

**APC Reference: 106/03/PR1-002**

## **STRUCTURAL/CIVIL ENGINEERING SPECIFICATIONS**

**FILE #29501TTE**



**SR5 – ISSUED FOR TENDER**  
**MARCH 03, 2017**

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**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 14 00 - Restriction of Work.
2. Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.
3. Section 01 51 00 - Temporary Utilities.
4. Section 01 52 00 - Construction Facilities.
5. Section 01 56 00 - Temporary Barriers and Enclosures.

### **1.2 BUILDING ORIENTATION GUIDE**

1. Not used.

### **1.3 WORK BY OTHERS**

1. Cooperate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
2. Coordinate work with that of other Contractors. If any part of work under this Contract depends on the proper execution of the work or on the results from another Contractor, report promptly, in writing, any defects which may interfere with proper execution of Work to the Departmental Representative.
3. All of the work shown on the plans will be executed by the General Contractor. This includes execution or installation, the supply of materials and of the equipment required.

### **1.4 WORK SEQUENCE**

1. Construct Work to accommodate Departmental Representative use of premises during construction.
2. Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
3. The work order must comply with the requirements of Section 01 32 16.07 - *Construction Progress Schedule - Bar (Gantt) Chart* and with Section 01 40 00 – *Regulatory Requirements*.
4. Based on the selected schedule, the General Contractor will take into consideration the fact that work will not be carried out in winter (from December 1<sup>st</sup> to March 31<sup>st</sup>). If work outside of this period is necessary to ensure temporary protection, heating or any other action related to wintering (snow removal, de-icing, lost time, etc.), said work will be included in the global cost for the reconstruction of the scarp walls.
5. Constraints are imposed to the General Contractor regarding the period of time during which the occupation of traffic lanes and sidewalk will be permitted.
6. Construction will take place between the month of May 2017 and November 1, 2017, as well as between April 1, 2018 and June 29, 2018. The end date of construction will be the issuance date of the Provisional Acceptance Certificate, when the facilities will be handed over to the Owner for him to use and the holdback payments, if any, will be paid (minus the value of the unfinished work and required corrections, if any).

## **1.5 CONTRACTOR USE OF PREMISES**

1. The construction site may be used until a substantial achievement of the work, inside areas identified by the Departmental Representative. Comply with the restrictions mentioned in Section 01 14 00 – *Work Restriction*.
2. Limit use of premises for Work, for storage, or access to allow:
  1. Departmental representative occupancy.
  2. Partial departmental representative occupancy.
3. Coordinate the use of the site based on the directives of the Departmental Representative.
4. The area where work is allowed to take place and provided to the General Contractor is shown on the plans.
5. Remove or modify the existing works to avoid damaging the sections that are to remain in place.
6. Repair or replace the sections of the existing structure that have been modified during construction in accordance with the directives of the Departmental Representative and for the purpose of connecting to or ensuring harmony with existing or adjacent structures.
7. After the completion of the work, the landscaping at the existing structure must be equivalent or better than its condition before the beginning of the work. All of the existing landscaping elements before construction and removed by the Contractor will be reinstalled as before.

## **1.6 OCCUPANCY BY PARKS CANADA AND ITS PARTNERS**

1. Parks Canada and its partners (MDN, CCBN) will occupy the areas located outside of the construction site's fenced area for the entire duration of construction, and will pursue normal activities during this period.
2. Collaborate with PWGSC and the Departmental Representative to establish the work schedule in order to avoid conflicts and to facilitate the latter's use of the facilities.

## **1.7 PARTIAL OCCUPANCY BY THE DEPARTMENTAL REPRESENTATIVE**

1. The Departmental Representative will supervise the work during the entire construction period. The General Contractor will provide the Departmental Representative with the access necessary to allow him to carry out the inspections required in order to verify the conformity of the work against contractual documents.

## **1.8 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

1. Not applicable.

## **1.9 EXISTING SERVICES**

1. Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
2. Where Work involves breaking into or connecting to existing services, give 48 hour notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic and tenant operations.

3. Provide alternative routes for personnel, pedestrian and vehicular traffic.
4. Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
5. Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
6. Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
7. Where unknown services are encountered, immediately advise the Departmental Representative and confirm findings in writing.
8. Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
9. Record locations of maintained, re-routed and abandoned service lines.
10. Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

#### **1.10 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 (control laboratory).
  9. Copy of Approved Work Schedule.
  10. Health and Safety Plan and Other Safety Related Documents.
  11. Other documents as specified.

#### **1.11 RIGHTS, PERMITS AND CERTIFICATES**

1. The General Contractor is obligated to obtain the required permits for the execution of the work and has to assume the entire costs. He will comply with all of the federal, provincial and municipal regulations and with any other law or regulation related to the work defined in this contract. He is also obligated to assume responsibility for any violation of relevant laws and regulations.
2. The General Contractor will pay for any obligation related to safety measures required by the *Loi sur la santé et la sécurité du travail du Québec* (Quebec law on health and safety in the work place), as well as for any expense deriving from such obligations.
3. Supply inspection certificates confirming that the work is compliant with the requirements of the competent authorities.



4. Provide to the Departmental Representative a copy of the applications submitted to the above mentioned authorities and the approval documents received.

#### **1.12 SITE VISIT**

1. In order to ensure familiarity with the conditions of the contracts and to obtain all of the information relevant to the execution of the work, visit the work site. Ignorance of site conditions does not constitute a valid reason to claim additional payment.
2. Prior to construction, the Contractor will make a photographic and video survey of the existing elements and structures (trees, sidewalks, lamp posts, wall and postern conditions, landscaping, etc.) and provide the Departmental Representative a copy of this survey.

#### **1.13 WORK IMPLEMENTATION**

1. Based on the control lines and levels indicated on the plans, the General Contractor will establish the main control and reference points required for the execution of the work and provide the required materials.
2. Take the necessary measures to ensure that the control points for implementation will not be moved during construction.
3. Provide all of the required materials to allow the Departmental Representative to make the verifications deemed necessary.
4. Before beginning work, the General Contractor must verify all of the measurements on site and notify the Departmental Representative of any error or discrepancy.
5. During the work, if non-conformities are identified following marking errors from the General Contractor, the latter will do the work again at his expense.
6. The General Contractor will hire a land surveyor in order to mark the reference points indicated on the plans at the construction site, as well as any other element required to execute the work.

#### **1.14 ERRORS OR OMISSIONS**

1. If, during the execution of the work, the General Contractor identifies contradictions between the plans and the site's physical configuration, or errors and omissions on the plans, he is obligated to notify the Departmental Representative in writing immediately. If the General Contractor elects to proceed without notifying the Departmental Representative, he will do so at his own risk until he receives the authorization to proceed from the Departmental Representative.

#### **1.15 WEATHER CONDITIONS**

1. The General Contractor cannot claim additional amounts due to inclement weather, including during the winter period. He will plan his work based on the weather conditions likely to occur at the time of execution and include in his bid the amounts necessary to re-do some work due to weather conditions.

#### **1.16 EXISTING SIGNS AND LIGHTING**

1. The existing signs and lighting apparatus that will hinder the execution of the work will be removed and reinstalled as before when work is complete, at the General Contractor's expense.
2. Commemorative plates, identification panels and various existing signs will be removed and stored at Parks Canada facilities for restoration purposes (at 280 rue St-Dominic). The Contractor will recover them before the end of construction.



### **1.17 PRESERVATION OF HISTORICAL / ARCHAEOLOGICAL NATURE**

1. The work zone is an important historical site that contains numerous archaeological resources. If an archaeological discovery takes place during work, notify the Departmental Representative immediately and await his written directions before continuing work in the area of the discovery.
2. During excavation work, an archaeologist hired and paid by the Departmental Representative will be present on site to establish if eventual archaeological discoveries are likely.
3. At least 48 hours prior to the commencement of excavation work, notify the Departmental Representative in order to insure the presence of a Departmental archaeologist.
4. The contractor must facilitate the archaeologist's access to the worksite and ensure his collaboration in order to obtain desired information.
5. As per the provisions of the contract, the Contractor must foresee halts of 30 minutes per half day of excavation, at his expense, in order to allow performance of archaeological surveys. If necessary, the halts provided that will not be used by the archaeologist may be added up for a longer halt used strictly for the same motives.
6. The General Contractor must provide for four extended halts of four hours each in the event of unforeseen discoveries requiring a halt longer than 15 minutes as described previously. The 4-hour halts may be used as needed and be combined in order to allow for greater halts. The General Contractor must take these halts into account in his bid and will therefore not be allowed to claim any additional payment due to the application of these halts.
7. If discoveries require a halt longer than allocated time, the General Contractor shall assign his machinery to other work in another area of the worksite in order to allow the work of archaeologists to be continued. If such a reassignment is not possible, the General Contractor will be compensated directly with the unused hours accumulated. If there are no accumulated hours, the General Contractor will be compensated, subject to the approval of Departmental Representative regarding the delays and costs actually and directly caused by this situation.
8. Considering the possibility of archaeological discoveries, manual excavation may be demanded. The presence of archaeological resources may also require to reduce the pace of the excavation in order to be able to clear certain types of vestiges and protect them from damages. In such a case, the General Contractor will be compensated, subject to the approval of Departmental Representative, regarding the delays and costs actually and directly caused by this situation.
9. Protection of vestiges and works: during excavation, the General Contractor shall take all reasonable precautions in order to protect all vestiges revealed and in order to clear them for examination by the archaeologists. Canada will not tolerate any derogation in this respect. If the General Contractor deteriorates through neglect any vestiges whatsoever, he will be held responsible and Canada may consider the implications.
10. Provide for a plan describing procedures to follow for the identification and protection of historical, archaeological, cultural and biological resources known to be on site and/or describing other procedures to follow in the case of unforeseen discovery of such elements on site or in the surrounding area during construction.
11. The plan will include methods to ensure the protection of resources known or discovered, as well as lines of communication between the General Contractor's employees and the Departmental Representative.
12. Any element of historical/archaeological nature discovered on site of excavation will be handed in to the Departmental Representative.

13. In the case of incidental findings of cultural resources in the absence of an archaeologist, the General Contractor will carefully suspend work in the immediate area of the discovery and notify the Departmental Representative.
14. Should the Departmental Representative allow demolition of archaeological resources on site, the General Contractor will take the necessary precautions in order to protect the adjacent archaeological resources that are to be preserved. The demolition of these elements must be performed gradually and in a controlled way after the archaeological surveys have been completed. If resources are damaged during work, notify Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 32 16.07 – Construction progress schedule - bar (GANTT) chart.
2. Section 01 52 00 - Construction facilities.
3. Section 01 56 00 – Temporary barriers and enclosures.
4. Section 01 74 11 – Cleaning.

### **1.2 ACCESS AND EGRESS**

1. Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps (for pedestrians and machinery) or ladders and scaffolding, separate from finished surfaces and in accordance with relevant municipal, provincial and other regulations. The General Contractor is entirely responsible for the design of the various elements required for traffic at the construction site, such as the access ramp or any other item. The General Contractor will provide the Departmental Representative with shop drawings signed and stamped by an engineer certified by the "Ordre des Ingénieurs du Québec", for review.
2. The General Contractor will access the construction site only via "Avenue Georges-VI. Deliveries to the General Contractor will also be made via this access. The General Contractor's workers, as well as the Departmental Representative, will only gain access to the construction site via this access. If required, access via "Côte de la Citadelle" may be used. Coordinate the access needs with the Departmental Representative. It is to be noted that "Avenue Georges-VI is a one way street. Therefore, any vehicle exiting the construction site will not be permitted to access "Grande-Allée" directly, against traffic, via the "Avenue Georges-VI". Vehicles will exit the site via "avenue Taché" and "avenue Ontario" as soon as the park will be open to traffic. In addition, circulation or shortcuts through the parking lot of the "Musée des Plaines d'Abraham" will be prohibited at all times. The CCBN (The National Battlefields Commission) will not tolerate any violation regarding the use of this one-way street the wrong way and offenders may be fined.
3. A flagperson will be posted near the construction site, on "Avenue Georges-VI", at all times and for the entire duration of construction in order to ensure the flow of traffic and public safety. If necessary, a flagperson may be posted on "Côte de la Citadelle", at the Contractor's expense, in order to ensure access.
4. A traffic management plan signed and stamped by an engineer will be submitted to the Departmental Representative at least three (3) weeks prior to the beginning of construction, for approval by the PWGSC and the parties involved in the project. A new traffic management plan will be submitted to the Departmental Representative should the configuration of the work change.
5. Access to the construction site will be disturbed during special events, i.e. when part of "Avenue Georges-VI will be closed. During these events (Quebec Day, the summer festival, concerts, etc.), one-way traffic will not be possible on "Avenue Georges-VI". During these periods, the Contractor's vehicles will have to circulate against the flow of traffic on "Avenue Georges-VI" upon exiting the construction site in order to gain access to "Grande-Allée". In addition, any vehicle required to circulate against traffic will be escorted by a CCBN security guard in order to ensure that the vehicle will leave the site safely. The person in charge of the construction site or his representative will notify the security guard at least 15 minutes before the escort is needed by calling 418-648-4652.

6. The Contractor will not tolerate parked or waiting vehicles, his employees or sub-contractors will not be tolerated on "Avenue Georges-VI". The Contractor's flagperson will enforce this procedure, which applies to the Contractor's employees and sub-contractors. Finally, backfilling material will not be deposited in the street.
7. All vehicles or tool vehicles belonging to the Contractor or to one of his sub-contractors will be registered. It is to be noted that the speed limit on CCBN grounds is 30 km/hr and that construction site vehicles or trucks circulating in the park will turn on their emergency flashers. The Highway Code is enforced on all of the CCBN's territory and failure to comply with the code may result in the issuance of tickets and fines and the loss of demerit points.

### **1.3 USE OF SITE AND FACILITIES**

1. Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated. As the Bastion Saint-Louis is a tourist attraction, the Contractor will ensure safety and enforce traffic regulations and the requirements of the CCBN regarding traffic on their territory.
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. Provide sanitary facilities for use by General Contractor's personnel. Keep facilities clean.

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

1. Not used.

### **1.5 SPECIAL REQUIREMENTS**

1. This section presents various specific requirements that need to be met, at all times, during the work. These specific requirements include:
  1. Coordinate the work with the Departmental Representative in order to permit the normal operations of the building and its occupants.
  2. Normal working hours are from Monday to Friday, 7:00 AM to 5:00 PM, except for statutory holidays. Additional expenses related to work executed outside of the normal construction hours will not be paid.
  3. Noisy work will not be performed from Monday to Friday, between the hours of 5:00 PM and 7:00 AM. Noisy work consists of, but is not limited to, deliveries of material, machinery or other items, the starting of machinery motors, demolition work, drilling related to the installation of anchors, concrete reinforcement bars and/or screws, and foundation work. The Departmental Representative reserves the right to stop work during normal working hours if the work is deemed to be too noisy.
  4. Municipal regulations on noise will be respected.
  5. Upon request, the Contractor may work on Saturdays. However, authorisation from the Departmental Representative will be required 72 hours in advance. Additional expenses for work executed outside of normal construction site hours will not be paid.
  6. Submit the work schedule in accordance with section 01 32 16.07 *Construction Progress Schedule - Bar (Gantt) Chart*.
  7. Ensure that the General Contractor's onsite workers are aware of the regulations and respect them, most especially the rules concerning fire safety, traffic, and construction site safety.
  8. Ensure that the access points to the construction site remain blocked whenever the site is not in use. The General Contractor is responsible for providing protection against trespassing.

9. Remain within the limits of the work area and access roads.
  10. Ensure that the materials/equipment are delivered outside of rush hour and early in the morning, except with the approval of the Departmental Representative. This also applies to all heavy transport vehicles at the construction site. Deliveries to the construction site will be between 9:30 AM and 11:30 AM, and between 1:30 PM and 3:00 PM. The Contractor will provide a delivery schedule at each construction site meeting.
  11. At all times, the General Contractor will provide two (2) parking spaces exclusively reserved for the Departmental Representative and his guests.
  12. When needed, the Contractor may use a maximum of two (2) parking spaces for his own needs.
  13. Parking spaces will not be assigned for the Contractor's employees other than for the parties mentioned above.
  14. As the construction area is located on land lot #1 314 826, it will be occupied solely for utilitarian purposes, i.e. by construction trailers or sanitary facilities. Work will not be performed in this area, nor will material storage be permitted.
  15. After the demolition of the concrete and of the backing of masonry walls, PWGSC will hire a land surveyor in order to scan the face of the demolished walls with a 3D laser scanner. This scan will be used to determine the actual extent of demolition by the Contractor in order to survey quantities. The Contractor will facilitate access to the construction site for the land surveyor. Plan to mobilize four (4) land surveyors for the right side of the bastion and two land surveyors for the left side of the bastion. The Contractor will coordinate work in order to ensure that the number of mobilizations is adequate. The cost of any additional mobilization will be at the Contractor's own expense.
  16. A permanent access will be ensures at the posterns indicating the pedestrian crosswalk between "Avenue Georges-VI" and "Côte de la Citadelle". A flagperson will be assigned to this location when heavy machinery will be passing between the work area/A and B storage areas (refer to the plans).
  17. Prior to construction, the Contractor will submit his working methods and his environmental plan to the Departmental Representative for comments and approval.
  18. Extensive tree protection will be required in order to limit impacting the trees as much as possible. Refer to section 32 01 90.33 for specific requirements.
  19. In the planting pit adjacent to the "Croix du Sacrifice", there is an irrigation network around the flower bed (carlon piping, nozzles, valves, etc.). Drawings of this system are not available. Therefore, the Contractor will plan the removal of this system and its complete reconstruction once work will be complete. Reconstruction will be performed as instructed by the Departmental Representative.
  20. Regarding landscaping and other elements in the "Croix du Sacrifice" sector located inside of the work area, the CCBN will remove some plants and shrubs. The Contractor will therefore coordinate the installation of his construction site fences in that area with the Departmental Representative in order to ensure that the plants and shrubs designated for preservation by the CCBN will not be damaged once the fences are installed. The other landscaping elements will be removed and restored by the Contractor.
  21. The tree next to the "Croix du Sacrifice" monument will be pruned by the CCBN in May 2017. Refer to section 32 01 90.33, item 3.7.1.
  22. Regarding wall stabilization methods, refer to section 02 41 16.
2. This list of special requirements is non-exhaustive and the General Contractor must comply with all of the requirements stated in the specifications.

## **1.6 CONSTRAINTS FOR THE OCCUPATION OF TRAFFIC LANES AND SIDEWALKS**

1. Before work begins, the General Contractor is responsible for making all of the necessary arrangements and to coordinate the closure of streets and sidewalks with the authorities concerned by the project work.

2. Install all of the work signage and maintain road traffic and pedestrian flow in accordance with section 01 56 00 - *Temporary Barriers and Enclosures*.
3. The General Contractor must refer to section 01 52 00 - *Construction Facilities* for the site boundaries to be respected.
4. Also refer to item 1.2 of this section regarding traffic requirements.

## **1.7 SECURITY**

1. Where security has been reduced by Work of Contract, provide temporary means to maintain security.
2. Security clearances:
  1. Not used.
3. Security escort:
  1. Not used.

## **1.8 BUILDING SMOKING ENVIRONMENT**

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

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 UNIT OR OVERALL PRICES**

1. Each unit or overall price in the contract is a lump sum; the Contractor commits to executing the work at this unit price, regardless of profit or loss. The unit or overall price for a structure or construction package must include all expenses, work, disbursements, payments, direct and indirect expenses, mobilizations, demobilizations, as well as any acts, facts, responsibilities, obligations, omissions and errors associated with the construction of this structure that may be incurred by the Contractor.
2. Unless otherwise indicated on the drawings and specifications, the Contractor will provide, for this unit or overall price, the materials, labour, equipment and accessories necessary to build the structure.
3. The unit or overall price must also include the transportation and application of materials, as well as all general company expenses including administration, insurance, contributions, interest, rentals, taxes and any incidental expenses. It must also include losses and damages that may occur due to the nature of the work, fluctuations in prices and salaries, business risks, strikes, delays not attributable to the Departmental Representative, restrictions relating to transportation, accidents and acts of nature.

### **1.2 OVERALL PRICE: DEFINITION**

1. When work has been identified in a precise and detailed manner, and a price has been agreed upon and accepted by both parties for everything.

### **1.3 UNIT PRICE: DEFINITION**

1. When specifications relating to the work have been determined in a precise and detailed manner, and all of the quantities or certain quantities indicated on the bid sheet have been provided as estimates.

### **1.4 DESCRIPTION OF THE ITEMS ON THE PRICES SCHEDULE**

#### **PART A – UNIT PRICES**

##### **1. SANDSTONE TO BE REPLACED ON THE EXTERIOR SIDING**

The sandstone for the exterior siding will be paid per square meter of exposed face. The price covers only the delivery at the construction site of embossed sandstone with a pattern identical to the original stone, as indicated in relevant sections of these specifications and/or shown on the plans. The stones for the stringcourse will be paid under this item.

##### **2. SANDSTONES TO BE REPLACED ON THE INTERIOR SIDING**

The sandstone for the interior siding will be paid per square meter of apparent of filled face. The price only covers the delivery at the construction site of embossed sandstone with a pattern identical to the original stone, as indicated in relevant sections of these specifications and/or shown on the plans. The stones for the stringcourse will be paid under this item.

##### **3. SANDSTONE TO BE REPAIRED, CASE #1**

Case #1 sandstones to be repaired will be paid per stone. The price covers the material, equipment and labour necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans.



**4. SANDSTONE TO BE REPAIRED, CASE #2**

Case #2 sandstones to be repaired will be paid per stone. The price covers the material, equipment and labour necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans.

**5. SANDSTONE TO BE REPAIRED, CASE #3**

Case #3 sandstones to be repaired will be paid per stone. The price covers the material, equipment and labour necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans.

**6. BACKING, LEFT SIDE OF THE BASTION**

Backing for the left side of the bastion corresponds to the volume of stone for backing that could be placed in the context of the reconstruction of the left side of the bastion. Backing material includes both new material and sandstone that could not be used for siding, replaced stringcourse sandstones or reusable stones from the existing backing. For payment purposes, the reference demolition line is shown in the cross-section views and the actual quantity will be that which is measured following a 3D land survey of the demolished surface carried out by the Departmental Representative. Unless otherwise indicated by the Departmental Representative, the Contractor is not authorized to demolish the existing backing beyond the demolition line indicated on the plans. The actual volume of stone for backing to install at the construction site will be determined based on an average thickness of exterior stone siding, which will be determined on site. The submitted price, payable per cubic meter of reconstructed backing, includes (without being limited to) the supply of the stone and mortar and the labour and equipment required for placement, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. The volume of backing required for the construction of the buttresses on the right side of the bastion is excluded from this item.

**7. BACKING, RIGHT SIDE OF THE BASTION**

Backing for the right side of the bastion corresponds to the volume of stone for backing that could be placed in the context of the reconstruction of the right side of the bastion. Backing material includes both new material and sandstone that could not be used for siding, replaced stringcourse sandstones or reusable stones from the existing backing. For payment purposes, the reference demolition line is shown in the cross-section views and the actual quantity will be that which is measured following a 3D land survey of the demolished surface carried out by the Departmental Representative. Unless otherwise indicated by the Departmental Representative, the Contractor is not authorized to demolish the existing backing beyond the demolition line indicated on the plans. The actual volume of stone for backing to install at the construction site will be determined based on an average thickness of exterior stone siding, which will be determined on site. The submitted price, payable per cubic meter of reconstructed backing, includes (without being limited to) the supply of the stone and mortar and the labour and equipment required for placement, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. The volume of backing required for the construction of the buttresses on the right side of the bastion is excluded from this item.

**PART B – LUMP SUMS**

**8. CONSTRUCTION SITE ORGANISATION**

Construction site organisation will be paid in a lump sum. The price covers, without being limited to, site organisation, coordination of operations, signs and safety at the construction site, site accesses, site configuration, site maintenance, site equipment mobilization and demobilization, bonds and insurance, expenses related to the preservation of the heritage/archaeological character, land surveys, construction site fences and barriers, expenses related to maintaining the construction site during the winter, tree and shrub protection, time lost due to special events taking place near the work area, and any other incidental expenses incurred as a result of specific provisions indicated on the plans or in the specifications, but not

included in a separate item of the price schedule. Terms of payment for site organisation will take the form of progress payments of the estimated work.

**9. REMOVAL OF VARIOUS EXISTING ELEMENTS AND VARIOUS PROTECTION OF EXISTING ELEMENTS AT THE WORK SITE**

This item will be paid in a lump sum. The price covers the expenses associated with the required removal and protection of existing elements on site, including (without being limited to) a Morris column, Parks Canada signs, gun embrasures, parapet walls, the stone wall along the sidewalk, and moving the advertisement display case, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payment of the estimated work.

**10. EXCAVATION, BACKFILLING AND DRAINAGE**

This item will be paid in a lump sum. The price covers the expenses associated with the excavation and backfilling of the masonry walls. All of the expenses associated with drainage, including (without being limited to) the installation of foundation drains, crushed stone, geotextile, geomembrane and related accessories, sky lights, the protection of existing buried electric cables, as well as other related elements, will also be included in the price. Finally, the latter covers the material, equipment and labour necessary to execute the work, the stockpiling of the material to be recovered, and incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for site organisation will take the form of progress payments.

**11. TEMPORARY STABILIZATION OF THE RIGHT SIDE OF THE BASTION**

This item will be paid in a lump sum. The price covers the expenses associated with the type of stabilization work selected by the Contractor in order to stabilize the right face of the bastion against soil thrust during construction. The price includes the labour, equipment, material, calculations by an engineer certified by the "Ordre des Ingénieurs du Québec", as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments.

**12. TEMPORARY STABILIZATION OF THE LEFT SIDE OF THE BASTION WITH SOIL ANCHORS**

This item will be paid in a lump sum. The price covers the expenses associated with the stabilization of the right face of the bastion using soil anchors in order to stabilize it against soil thrust during construction. It includes, without being limited to, the soil anchors, pull off tests, tension tests and any other related work. The price also includes the labour, equipment, material necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments.

**13. DISASSEMBLY OF THE MASONRY WALL (LEFT SIDE OF THE BASTION)**

This item will be paid in a lump sum. The price covers the expenses associated with the disassembly of the masonry walls on the left face of the bastion, including (without being limited to) the disassembly of the siding, stone marking, the temporary storage of the stone siding to be reinstalled at the construction site or in another location determined by the Contractor, the removal and disposal of the concrete between the siding and the existing masonry backing, the disassembly of the existing masonry backing up to the demolition line indicated on the plans, the preservation of the existing frame indicated on the plans, as well as any other related work. The price includes the labour, equipment and material necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments. Terms of payment for this item will be progress payments.

**14. DISASSEMBLY OF THE MASONRY WALL (RIGHT SIDE OF THE BASTION)**

This item will be paid in a lump sum. The price covers the expenses associated with the disassembly of the masonry walls on the left face of the bastion, including (without being limited to) the disassembly of the siding, stone marking, the temporary storage of the stone siding to be reinstalled at the construction site or in another location determined by the Contractor, the removal and disposal of the concrete between

the siding and the existing masonry backing, the disassembly of the existing masonry backing up to the demolition line indicated on the plans, the preservation of the existing frame indicated on the plans, as well as any other related work. The price includes the labour, equipment and material necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments. Terms of payment for this item will be progress payments.

**15. RECONSTRUCTION OF THE MASONRY WALL (RIGHT SIDE OF THE BASTION)**

This item will be paid in a lump sum. The price covers the expenses associated with the reassembly of the masonry walls of the right side of the bastion, including, without being limited to, the stainless steel anchors for the stone siding, the V-Rod reinforcement bars (including the existing pins), the reconstruction of the siding and stringcourse, the construction of the barbicans, the installation of the downspouts, and any other related work. The price also includes the labour, equipment and material necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments. Terms of payment for this item will be progress payments.

**16. RECONSTRUCTION OF THE MASONRY WALL (LEFT SIDE OF THE BASTION)**

This item will be paid in a lump sum. The price covers the expenses associated with the reassembly of the masonry walls of the left side of the bastion, including, without being limited to, the stainless steel anchors for the stone siding, the V-Rod reinforcement bars (including the existing pins), the concrete footing and rock anchors, the reconstruction of the siding and stringcourse, the construction of the barbicans, the installation of the downspouts, and any other related work. The price also includes the labour, equipment and material necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments. Terms of payment for this item will be progress payments.

**17. RECONSTRUCTION OF THE BUTTRESSES (LEFT SIDE OF THE BASTION)**

This item will be paid in a lump sum. The price includes the expenses associated with the reconstruction of the new buttresses on the left side of the bastion, including (without being limited to), the V-Rod reinforcement bars (including the existing pins), the stone siding and the backing of the new buttresses. The price also includes the labour, equipment and material necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments. Terms of payment for this item will be progress payments.

**18. REPOINTING OF WALL SECTIONS TO BE PRESERVED**

This item will be paid in a lump sum. The price includes the expenses associated with the repointing of the wall sections to be preserved (refer to the plans for the locations). The price also includes the labour, equipment and material necessary to execute the work, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments. Terms of payment for this item will be progress payments.

**19. DEMOLITION ET RECONSTRUCTION OF THE COPING**

This item will be paid in a lump sum. The price covers the expenses associated with demolition and reconstruction of the concrete coping and of the membrane under it. The price includes the labour, equipment and material, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments.

**20. CLEANING OF THE MASONRY AND STONE SIDING SPALLING**

This item will be paid in a lump sum. The price covers the expenses associated with the cleaning of the masonry before the disassembly of the walls and of the stone siding once all of the scarp walls are rebuilt. The price also covers the expenses related to the spalling of the stone siding. The price includes the

labour, equipment and material, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments.

**21. EXTERIOR LANDSCAPING ELEMENTS AROUND THE “CROIX DU SACRIFICE”**

This item will be paid in a lump sum. The price covers the expenses associated with the exterior elements and landscaping around the “Croix du Sacrifice” monument. The price covers, without being limited to, the demolition of the existing planting pit and the disposal of the plants, the removal of the existing irrigation system, which will be handed to the Departmental Representative, the construction of a new planting pit, the installation of the aluminium edging, as well as any other work related to the rehabilitation of the exterior elements around the “Croix du Sacrifice”. The labour, equipment and material, as well as any incidental expenses are also included, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments.

**22. LANDSCAPING AND EXTERIOR ELEMENTS**

This item will be paid in a lump sum. The price covers the expenses associated with the rehabilitation of the exterior elements and landscaping, including, without being limited to, the reconstruction of the paved and gravel path, repairs to the paved sidewalk, repairs to the wall near the “Croix du Sacrifice” monument, the placement of topsoil and sod, as well as any element damaged by the Contractor during construction. The price also includes equipment and material, as well as any incidental expenses, as indicated in the relevant sections of these specifications and/or shown on the plans. Terms of payment for this item will be progress payments.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Relevant specification sections.
2. Particular requirements for inspection and testing to be carried out by testing laboratory designated by the Departmental Representative are listed in the items below.

### **1.2 APPOINTMENT AND PAYMENT**

1. Departmental Representative will appoint and pay for services of testing laboratory except follows:
  1. Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  2. Inspection and testing performed exclusively for [Contractor's] [Design-Builder's] convenience.
  3. Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  4. Mill tests and certificates of compliance.
  5. Tests specified to be carried out by the General Contractor under supervision of the Departmental Representative.
2. When the inspections or tests carried out by the designated testing laboratory show that the work is not conform with the contract requirements, the General Contractor will pay for additional tests or inspections as required by the Departmental Representative to verify acceptability of corrected work.

### **1.3 GENERAL CONTRACTOR'S RESPONSIBILITIES**

1. Provide labour, equipment and facilities to:
  1. Provide access to Work for inspection and testing.
  2. Facilitate inspections and tests.
  3. Make good Work disturbed by inspection and test.
  4. Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
2. Notify the Departmental Representative 48 hour minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
3. Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
4. Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by the Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

### **PART 3 - EXECUTION**

#### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 14 00 – Work restrictions.
2. Section 01 33 00 – Submittal procedures.

### **1.2 DEFINITIONS**

1. Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
2. Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
3. Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
4. Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission).
5. Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
6. Master Plan: summary-level schedule that identifies major activities and key milestones.
7. Milestone: significant event in project, usually completion of major deliverable.
8. Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
9. Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

### **1.3 REQUIREMENTS**

1. The Contractor will submit his global schedule three (3) weeks prior to the beginning of construction or at the kick-off meeting at the latest. The schedule submitted at the first construction site meeting will be the reference schedule. The global schedule will be revised and submitted before each construction site meeting.
2. Ensure Master Plan and Detailed Schedules are practical and remain within specified Contract duration.
3. Plan to complete Work in accordance with prescribed milestones and time frame.
4. Limit activity durations to maximum of approximately 15 working days, to allow for progress reporting.
5. 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.



6. The project's critical path will be indicated clearly.
7. The execution schedule will take the execution deadlines listed in section 01 11 00 into consideration, as well as the work restriction dates listed in section 01 14 00.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

1. Provide submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
2. Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
3. Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

#### **1.5 PROJECT MILESTONES**

1. Not used.

#### **1.6 MASTER PLAN**

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

#### **1.7 PROJECT SCHEDULE**

1. A schedule of the major coming events taking place in the area (FEQ, "Grand Prix Cycliste", Quebec Day, Remembrance Day, etc.) is attached to this section.
2. Anticipate that the accesses to the construction sites will not be available at least five (5) separate days throughout the year (various week days between the months of April and December).
3. Anticipate that the construction site will be closed during at least five (5) separate days throughout the year due to special events taking place in the area. The days during which the construction site will be closed are project-specific and they exclude week-ends and other statutory holidays included in collective labour agreements applicable to the construction industry.
4. Plan for construction site surveillance during the special events (services of a security guard during at least five (5) separate days throughout the year, between the months of April and December).
5. Develop detailed Project Schedule derived from Master Plan.
6. Ensure that the detailed Project Schedule includes the following minimum milestone and activity types:
  1. Awarding of the contract.
  2. Shop drawings, samples (including the time required to obtain approval from the Departmental Representative).
  3. Permits.
  4. Mobilization.
  5. Excavation.

6. Backfill.
7. Temporary shoring.
8. Installation of the soil anchors.
9. Disassembly of the walls of two sides of the bastion.
10. Reassembly of the walls of two sides of the bastion.
11. Supplied items with long delivery delays.
12. Delivery dates requested for material provided by the Departmental Representative.
13. Landscaping, correction of deficiencies and final acceptance of the project.
14. Interruption of the work for the winter.

## **1.8 PROJECT SCHEDULE REPORTING**

1. Update Project Schedule every week to reflect activity changes and completions, as well as activities in progress. Distribute the updated schedule to the parties involved two days before the construction site meeting.
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.
3. All of the modifications to the work following change requests from the Departmental Representative or unforeseen site conditions will be included to the project schedule. The Contractor will reorganize his schedule in order to avoid any additional delays. If additional delays cannot be avoided and demonstrated based on the reference schedule, the Contractor will notify the Departmental Representative immediately and provide an updated schedule showing the implications of the modification with regard to the critical path.

## **1.9 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**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**

## **APPENDIX**

### **LIST OF COMING EVENTS (BGÉ) IN 2017 PARKS CANADA**

LIST OF COMING EVENTS IN 2017 (BGÉ) - PARKS CANADA

Event	Type	Description	Site(s)	Date and Event Start Time	Date and Event End Time
"Village nordik du Port de Québec" 2017	Entertainment / animation	Ice fishing and family winter activities	Bassin Louise	2017-01-19 20:30	2017-03-12 09:00
"Traversée de la Gaspésie"		Cross-country skiing in various Quebec City trails		2017-01-27 06:30	2017-01-27 10:00
"Carnaval de Québec" 2017	Entertainment / animation	Winter animation	Place Assemblée Nationale, Francophonie ...	2017-01-27 12:00	2017-02-12 13:00
Cross-country Skiing Work Cup Finals 2017	Sports competition	FIS Cross-Country World Cup	Plains of Abraham	2017-01-30 00:00	2017-03-24 00:00
Jamboree - FIS World Cup	Sports competition	Snowboard and freestyle World Cup	Îlot Fleurie	2017-02-09 12:00	2017-02-12 23:00
"Manif d'art international"	Exhibit	Visual arts - biennial event	To ba announced	2017-02-17 15:00	2017-05-14 16:00
"Pentathlon des neiges" 2017	Sports competition	Sports competition	Plains of Abraham and varous city streets	2017-02-24 11:00	2017-03-05 12:00
Saint-Patricks Day Parade 2017	Parade	Parade celebrating Irish heritage	Various city streets (Cartier, Grande Allée, St-Louis, Du Fort, Buade, Côte Fabrique, St-Jean)	2017-03-25 13:30	2017-03-25 15:30
Tour bus	Tourism	Daily tour of the Battlefields Park	Plains of Abraham	2017-04-15 00:00	Site closed in the fall
"Festival de magie" 2017 (magic festival)	Entertainment / animation		Place d'Youville	2017-05-04 00:00	2017-05-07 00:00
"Défilé des Voltigeurs" 2017	Commemoration / inauguration	Military parade	Old Quebec City and "Place George-V"	2017-05-06 07:00	2017-05-06 12:00
"Éveil des plaines" 2017	Sports competition	Run on the Plains of Abraham	Plains of Abraham	2017-05-13 00:00	2017-05-13 23:59
"La course au secondaire (Pierre Lavoie)"	Walk / run	Start of a run to Montreal by youths of highchool age	Agora (to be confirmed)	2017-05-13 10:30	2017-05-13 10:30
Cyclovia		Bicycle stakes	Various city streets	2017-05-23 10:30	2017-05-23 10:30
"Motivaction jeunesse"	Walk / run	Motivaction jeunesse	Plains of Abraham and Battlefields Canada	2017-05-25 00:00	2017-05-27 00:00
"Marche de la Mémoire" 2017			Plains of Abraham - large site and Grande-Allée	2017-05-26 08:00	2017-05-26 15:00
"Société Alzheimmer de Québec"		Société Alzheimmer de Québec	Plains of Abraham and Battlefields Canada	2017-05-26 00:00	2017-05-28 00:00
"Où tu vas quand tu dors en marchant... ?" 2017	Entertainment / animation	Traveling theater company	To be announced	2017-05-26 18:00	2017-06-11 23:00
"Festival d'été de Québec" (summer festival)	Music / concert	Various entertainment and activities	Plains of Abraham and Battlefields Canada	2017-05-29 00:00	2017-07-26 00:00
Battle of the Plains of Abraham 2017		New event	Plains of Abraham	2017-06-02 00:00	2017-06-02 23:59
"Foire écosphère, environnement et cohabitation"	Exhibit / salon	More than 100 exhibits and 30 conferences on biological foods, health, etc.	Espace 400 <sup>e</sup>	2017-06-03 00:00	2017-06-03 00:00
"Route sans fin" 2017	Bicycle trip	Bicycle trip for Quebec City's "Centre de jeunesse" (youth center)		2017-06-05 00:00	2017-06-05 11:00
"ComédiHa! Fest Québec" 2017	Entertainment / animation	Comedy festival		2017-06-07 00:00	2017-06-18 00:00
"Défi entreprises" 2016	Walk / run		Grande-Allée	2017-06-11 08:30	2017-06-11 08:30
Opening of the Grande Allée terrases 2017	Entertainment / animation	Various entertainment and activities	Grande-Allée	2017-06-15 16:00	2017-06-16 00:00
"Défi des escaliers" 2017		Start/Arrival at the "Bois de Coulonges"	Bois de Coulonge and Quebec City Stairways	2017-06-16 00:00	2017-06-16 23:59
"Grand Défi Pierre Lavoie" 2017	Bicycle trip	Passage of the 1,000 km trip	Various streets and Centre Vidéotron	2017-06-16 08:30	2017-06-16 08:30
BBQ FEST Rickard's 2017	Entertainment / animation		Espace 400 <sup>e</sup>	2017-06-16 11:00	2017-06-18 18:00
"Grand Défi Pierre Lavoie" 2017			Plains of Abraham	2017-06-17 00:00	2017-06-17 08:00
"Tour de Beauce - Étape Québec" 2017	Sports competition	Cycling	Plains of Abraham - large site and Grande Allée	2017-06-17 06:00	2017-06-17 19:00
"Fête nationale dans la Capitale" 2017 (Quebec Day celebrations)				2017-06-23 00:00	2017-06-23 23:59
Celebrate Canada 2017	Entertainment / animation	Canada Day family celebrations	Plains of Abraham	2017-07-01 00:00	2017-07-01 23:59

Event	Type	Description	Site(s)	Date and Event Start Time	Date and Event End Time
"Fête de la Ville" 2017	Commemoration / inauguration	Quebec City anniversary celebrations	City Hall area	2017-07-03 00:00	2017-07-03 23:59
"Festival International d'été de Québec" (international summer festival)	Entertainment / animation	Large scale entertainment / concerts	Place d'Youville; Espace 400 <sup>e</sup> ; Plains of Abraham - large site; Parc de la Francophonie"	2017-07-06 20:30	2017-07-16 20:30
Rendez-vous 2017	Entertainment / animation	Tall ships and animation at the wharves	Wharves and St-Lawrence River	2017-07-18 10:00	2017-07-23 17:00
"Festival des Journées d'Afrique" 2017			Place d'Youville	2017-07-27 00:00	2017-07-30 23:59
"Québec SingleTrack Expérience"	Bicycle trip	Stage race at various sites	Méridci	2017-07-30 08:00	2017-08-05 18:00
"Salon des métiers d'art de Québec" 2017	Exhibit / salon	Artisans' show	Espace 400 <sup>e</sup>	2017-08-01 00:00	2017-08-13 23:59
"Grands feux Loto-Québec" 2017	Entertainment / animation	Fireworks	St-Lawrence River	2017-08-05 22:00	2017-08-05 23:00
New France Festival	Entertainment / animation	Celebrations / history animation	Place de Paris, Place Royale, Parc de Unesco, Parc de la Cetière, Batterie Royale, Rue St-Pierre	2017-08-09 08:00	2017-08-13 17:00
"Défilé des Fêtes de la Nouvelle-France" 2017	Parade	Parade	Grande-Allée	2017-08-09 16:00	2017-08-09 22:00
"Festival celtique de Québec" (celtic festival)	Entertainment / animation		D'Youville, Esplanade	2017-08-16 08:00	2017-08-20 15:00
"Festibière" 2017	Exhibit / salon		Espace 400 <sup>e</sup>	2017-08-17 00:00	2017-08-20 00:00
"Le Marathon des Deux Rives" 2017	Walk / run	42,25 km international run	Others (see description)	2017-08-27 00:00	2017-08-27 23:59
"Bordeaux Fête le vin à Québec"	Other	Wine tasting festival	Espace 400 <sup>e</sup>	2017-08-31 08:00	2017-09-03 09:00
"Fête arc-en-ciel" 2017	Entertainment / animation	Entertainment, workshops and animation	Place d'Youville; Rue St-Jean (Faubourg); others (see description)	2017-08-31 12:30	2017-09-03 20:30
"Grand Prix cycliste de Québec" 2017	Sports competition	Cycling	Grande-Allée and various streets	2017-09-08 00:00	2017-09-08 23:59
"Festival de cinéma de la Ville de Québec" or FCVQ" (film festival) 2017	Entertainment / animation		Place d'Youville	2017-09-13 00:00	2017-09-23 23:59
"Course à la vie CIBC" 2017	Walk / run	Fundraising walk	Plains of Abraham and various city streets	2017-09-29 07:00	2017-10-01 14:00
Cross-country Université Laval	Sports competition	Cross-country Université Laval	Plains of Abraham and Battlefields Canada	2017-10-07 00:00	2017-10-08 00:00
"La grande Marche" (Pierre Lavoie)	Walk / run	Walk for everyone in the context of the "Grand défi Pierre Lavoie"	to be annouced. Option 1: Parliament Hill; Option 2: Old Port	2017-10-21 10:30	2017-10-21 10:30
"Parade des Voltigeurs"	Commemoration / inauguration	Parade	Plains of Abraham and Battlefields Canada	2017-11-04 00:00	2017-11-05 00:00
Remembrance Day	Commemoration / inauguration	Remembrance Day	Plains of Abraham and Battlefields Canada	2017-11-11 00:00	2017-11-12 00:00
German Christmas Market 2017	Entertainment / animation		City Hall Gardens	2017-11-23 20:30	2017-12-17 20:30
2018 New Year celebrations in Quebec City	Entertainment / animation		Grande-Allée and Place de l'Assemblée-Nationale	2017-12-31 20:00	2018-01-01 00:15

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 32 16.07 – Construction Progress Schedule - Bar (GANTT) Chart.
2. Section 01 35 29.06 – Health and Safety Requirements.
3. Section 01 45 00 – Quality Control.
4. Section 01 74 11 – Cleaning.
5. Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

### **1.2 ADMINISTRATIVE**

1. Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit 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.
2. The documents issued by a Subcontractor must be sent through the General Contractor, both incoming and outgoing. The Subcontractor must stamp the documents with the received date and keep a log of the documents that are both received and issued. The representative of the General Contractor must also ensure the overall coordination in terms of drawings and follow up with suppliers.
3. Do not undertake work for which the delivery of documents and samples is requested before all of the pieces submitted have been completely finished, and that the shop drawings, samples and product descriptions have not been returned as well as reviewed by the Departmental Representative.
4. Present shop drawings, product data, samples and mock-ups in SI Metric units.
5. Where items or information is not produced in SI Metric units converted values are acceptable.
6. Review submittals prior to submission to Departmental Representative. 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.
7. Arrange the submitted documentation with the work requirements and contractual documents. The drawings will not be approved one at a time. The audit will be performed when all of the related drawings have been submitted.
8. Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
9. Verify field measurements and affected adjacent Work are co-ordinated.
10. General Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
11. General Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

12. Keep one reviewed copy of each submission on site.

### **1.3 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 General Contractor to illustrate details of a portion of Work.
2. Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec of Canada (Engineer who is a member of the "Ordre des Ingénieurs du Québec", or OIQ).
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 10 days for Departmental Representative's review of each submission. The General Contractor's delay for the production of shop drawings, and their review by the Departmental Representative, must be taken into consideration in the General Contractor's deadline and cannot be used as an excuse for missed deadlines.
5. Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
6. Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested
7. Accompany submissions with transmittal letter, in 2, containing:
  1. Date;
  2. Project title and number;
  3. General 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. General Contractor;
    2. Subcontractor;
    3. Supplier;
    4. Manufacturer;
    5. Retailers, if applicable.
  4. General Contractor's stamp, signed by General 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. Capacities;
  5. Performance characteristics;
  6. Standards;
  7. Operating weight;
  8. Wiring diagrams;
  9. Single line and schematic diagrams;
  10. Relationship to adjacent work.
9. After Departmental Representative's review, distribute copies.
10. Submit one (1) electronic copy of the shop drawings prescribed in the technical sections of the specifications and according to the reasonable requirements of the Departmental Representative. After a review by the Departmental Representative, the shop drawings, including comments if any, will be scanned in the PDF format and returned to the General Contractor, who will be advised via email at the address provided to the Departmental Representative. This notice will specify the procedure for the pick-up of the reviewed shop drawings. No paper copies of the reviewed shop drawings will therefore be sent to the General Contractor. The General Contractor must pick up the drawings and distribute them, as required.
11. In some sections of the specifications, sketch maps provided by manufacturers, characteristics indicated in manufacturers' catalogues, diagrams, tables, charts, illustrations and descriptive data may be accepted as shop drawings.
12. The documents mentioned previously (item 11) will be accepted only if they comply with the following provisions:
  1. They will include only information that is project-related;
  2. Basic information will be complemented with additional project-related information.
13. Submit 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  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 3 years of date of contract award for project.
14. Submit 1 electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  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.
15. Submit 1 electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  1. Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

16. Submit 1 electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
17. Submit 1 electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
18. Delete information not applicable to project.
19. Supplement standard information to provide details applicable to project.
20. If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, transparency copies 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.
21. The procedure for the submittal and review of shop drawings is intended to enable the Departmental Representative to review the drawings and detect, if appropriate, any cases of non-compliance or deviations. Under no circumstances does this review constitute an exhaustive verification of the data or information appearing therein.
22. The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  1. This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with General Contractor submitting same, and such review shall not relieve General Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  2. Without restricting generality of foregoing, General Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades. The comments and/or the corrections included in these drawings do not constitute any surety or approval, if an exemption to these requirements should be present.

#### **1.4 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 Departmental Representative's.
3. Notify Departmental Representative 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 Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
6. Make changes in samples which Departmental Representative 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.

## **1.5 SAMPLES OF WORK**

1. Provide samples of the work required in section 01 45 00 – *Quality Control*.

## **1.6 CERTIFICATES AND TRANSCRIPTS**

1. Submit the relevant documents required by the "Commission de la Santé et de la sécurité au travail" or CNESST (workplace health and safety commission) immediately after the contract has been awarded.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 33 00 – Submittal procedures.
2. Section 01 35 43 – Environmental procedures.

### **1.2 REFERENCES**

1. Province of Québec
  1. *Loi sur la santé et la sécurité du travail* L.R.Q., c. S-2.1 (Act respecting occupational health and safety).
  2. *Code de sécurité pour les travaux de construction* L.R.Q., c. S-2.1, r.4 (Safety code for the construction industry).

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

1. Make submittals in accordance with section 01 33 00 - Submittal Procedures.
2. Submit site-specific Health and Safety Plan to the "Commission des normes, de l'équité, de la santé et de la sécurité du travail", or CNESST (workplace health and safety commission) and ("Association paritaire en santé et sécurité du secteur de la construction" or APSAM (joint health and safety association of the construction sector) (ASP Construction), as described in article 1.8, within 10 days after date of Notice to Proceed and prior to commencement of Work.
3. Departmental representative will review Contractor's site-specific prevention program and provide comments to Contractor within 10 days after receipt of the document. Revise plan as appropriate and resubmit to Departmental representative within 5 days after receipt of comments from Departmental representative. Departmental representative reserves the right not to authorize the start of work on the construction site as long as the content of the prevention program is not satisfactory. The Contractor shall then update his prevention program and resubmit it to the Departmental representative if the scope of work changes or if the working methods of the Contractor differ from his initial plans or for any other applicable new condition.
4. Departmental representative's review of Contractor's site-specific prevention program should not be construed as approval of the program and does not reduce the Contractor's overall responsibility for construction Health and Safety during the work.
5. Submit copies of Contractor's authorized representative's construction site health and safety inspection reports to Departmental representative once a week.
6. Submit to Departmental representative within 24 hours a copy of any inspection report, correction notice or recommendation issued by Federal, Provincial and Territorial health and safety inspectors.
7. Submit to Departmental representative within 24 hours an investigation report for any accident involving injury and any incident exposing a potential hazard.
  1. The investigation report shall contain at least the following:
    1. Date, time and place of accident;
    2. Name of sub-contractor involved in the accident;
    3. Number of persons involved and condition of wounded;

4. Witness identification;
  5. Detailed description of tasks performed at the time of the accident;
  6. Equipment being used to accomplish the tasks performed at the time of the accident;
  7. Corrective measures taken immediately after the accident;
  8. Causes of the accident;
  9. Preventive measures that have been put in place to prevent a similar accident.
8. Submit to Departmental representative WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittals. Contractor must also keep one copy of these documents on the construction site.
  9. Medical Surveillance: where prescribed by legislation, regulation or prevention program, submit certification of medical surveillance for construction site personnel prior to commencement of Work, and submit additional certifications for any new construction site personnel to Departmental representative.
  10. Submit to Departmental representative an on-site Emergency Response Plan at the same time as the prevention program. The Emergency Response plan must contain the elements listed in the article "GENERAL REQUIREMENTS" of this section.
  11. Submit to Departmental representative copies of all training certificates required for the application of the prevention program, in particular (if applicable) for the following:
    1. First aid in the workplace and cardiopulmonary resuscitation;
    2. Work likely to release asbestos dust (mandatory for all work where asbestos is present);
    3. Work in confined spaces (mandatory for all work in confined spaces);
    4. Lockout-tagout procedures (mandatory for all work requiring lockout);
    5. Safely operating forklift trucks (mandatory for all forklift usage);
    6. Safely operating elevating work platforms (mandatory for the use of all elevating platforms);
    7. Any other requirement of regulations or the safety program.
  12. In addition, the certifications of the Cours de santé et sécurité générale pour les chantiers de construction (General Health and Safety Training for Construction Sites) shall be available on demand on the construction site.
  13. Engineer's plans and certificates of compliance: Contractor must submit to the Departmental representative and to the *Commission des normes, de l'équité, de la santé et de la sécurité du travail* (CNESST) a copy signed and sealed by engineer of all plans and certificates of compliance required pursuant to the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry) or by any other legislation or regulation or by any other clause in the specifications or in the contract. The Contractor must also submit a certificate of conformity signed by an engineer once the facility for which these plans were prepared has been completed and before a person uses the facility. A copy of these documents must be available on site at all times.

#### 1.4 FILING OF NOTICE OF CONSTRUCTION SITE OPENING

1. Notice of construction site opening shall be submitted to the CNESST before work begins. A copy of such notice and acknowledgment of receipt from the CNESST shall be submitted to Departmental representative.
  1. At the completion of all the work, a notice of construction site closing shall be submitted to the CNESST, with a copy to Departmental representative.

2. The Contractor shall assume the role of being the Principal Contractor in the limits of the construction site and elsewhere where he must execute work within the framework of this project. The Contractor shall recognize the responsibility of being the Principal Contractor of the project and identify himself as such in the notice of the construction site opening he provides to the CNESST.
3. The Contractor shall accept to divide and identify the construction site adequately in order to define time and space at all times throughout the course of the project.

## **1.5 SAFETY ASSESSMENT**

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

## **1.6 MEETINGS**

1. Schedule and administer Health and Safety meeting with Departmental representative prior to commencement of Work.
2. Contractor's representative with decision power must attend any meetings at which construction site safety and health issues are to be discussed.
3. If it is anticipated that there will be 25 workers or more on the construction site at any given time, the Contractor shall set up a worksite committee and hold meetings as required by the *Code de sécurité pour les travaux de construction* (S-2.1, r. 4) (Safety code for the construction industry). A copy of the minutes of the meetings of the committee shall be provided to the Departmental representative no later than 5 days after the committee meeting.

## **1.7 REGULATORY REQUIREMENTS**

1. Comply with all legislation, regulations and standards applicable to the construction site and its related activities.
2. Comply with specified standards and regulations to ensure safe operations on a site containing hazardous or toxic materials.
3. Always use the most recent version of the standards specified in the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry), notwithstanding the date indicated in that Code.

## **1.8 COMPLIANCE REQUIREMENTS**

1. Comply with the *Loi sur la santé et la sécurité du travail* (L.R.Q., c. S-2.1) (Act Respecting Occupational Health and Safety) and the *Code de sécurité pour les travaux de construction* (S-2.1, r. 4.) (Safety code for the construction industry) in addition to respecting all the requirements of this specification manual.

## **1.9 RESPONSIBILITIES**

1. The Contractor must acknowledge and assume all the tasks and obligations which customarily devolve upon a principal Contractor under the terms of the *Loi sur la santé et la sécurité du travail* (L.R.Q., ch. S-2.1) (Act Respecting Occupational Health and Safety) and the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry).
2. The Contractor must be responsible for health and safety of persons on construction site, safety of property on construction site and for the protection of persons adjacent to construction site and the environment to the extent that they may be affected by conduct of the work.

3. No matter the size or location of the construction site, the Contractor must clearly define the limits of the construction site by physical means and respect all specific regulation requirements applicable in this regard. The means chosen to define the limits of the construction site must be submitted to the Departmental representative.
4. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific prevention Plan.

#### **1.10 WORK PERFORMED BY EXTERNAL CONTRACTORS**

1. It is not anticipated that work will be performed by an external contractor that has not been hired by the Contractor. Should such a situation be required, the Contractor will comply with the requirements of this section of the specifications.
2. The Contractor must take the necessary steps to protect the health and safety of external contractors that have no contractual link with the Contractor but have been mandated by the Departmental representative to perform certain work. In return, these external contractors are obligated to submit to the authority of the Contractor (Principal Contractor). A subordination agreement must be signed by the Contractor and by each external contractor to this effect and submitted to the Departmental representative prior to the start of the work of each contractor (see the wording in the article HEALTH AND SAFETY SUBORDINATION AGREEMENT).

#### **1.11 GENERAL REQUIREMENTS**

1. Before undertaking the work, prepare a site-specific prevention program based on the hazards identified according to the article "HAZARD ASSESSMENT" and the article "RISKS INHERENT TO THE WORKSITE" in this section. Apply this program in its totality from the start of the project until demobilization of all personnel from the construction site. The prevention program shall take into consideration the specific characteristics of the project and cover all the work to be executed on the construction site.
  1. The safety program must include at least the following:
    1. Company safety and health policy;
    2. Description of the stages of the work;
    3. Total costs, schedule and projected workforce curves;
    4. Flow chart of safety and health responsibilities;
    5. Physical and material layout of the construction site;
    6. Risk assessment for each stage of the work, including preventive measures and the procedures for applying them;
    7. Identification of the preventive measures relative to the specific risks inherent to the worksite indicated in the article "RISKS INHERENT TO THE WORKSITE";
    8. Identification of preventive measures for health and safety of employees and / or public works site as indicated in the article "SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND PUBLIC";
    9. Training requirements;
    10. Procedures in case of accident/injury;
    11. Written commitment from all parties to comply with the safety program;
    12. Construction site inspection checklist based on the preventive measures;
    13. Emergency response plan which shall contain at least the following:
      1. Construction site evacuation procedures;
      2. Identification of resources (police, firefighters, ambulance services, etc.);



3. Identification of persons in charge of the construction site;
4. Identification of the first-aid attendants;
5. Communication organizational chart (including the person responsible for the site and the departmental representative);
6. Training required for those responsible for applying the plan;
7. Any other information needed, in the light of the construction site's characteristics.
  1. If available the Departmental representative will provide the evacuation procedures to the Contractor who shall then coordinate the construction site procedure with that of the site and submit it to the Departmental representative.
2. Departmental representative may respond in writing, where deficiencies or concerns are noted in the prevention program and may request resubmission with correction of deficiencies or concerns.
3. In addition to the prevention program, during the course of the work the Contractor shall elaborate and submit to the Departmental representative specific written procedures for any work having a high risk factor of accident (for example: demolition procedures, specific installation procedures, hoisting plan, procedures for entering a confined space, procedures for interrupting electric power, etc.) or at the request of the Departmental representative.
4. The Contractor shall plan and organize work so as to eliminate the danger at source or ensure collective protection, thereby minimizing the use of personal protective equipment.
5. Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.
6. All mechanical equipment (for example, but not limited to: hoisting devices for persons or materials, excavators, concrete pumps, concrete saws) shall be inspected before delivery to the construction site. Before using any mechanical equipment, the Contractor shall obtain a certificate of compliance signed by a qualified mechanic dated less than a week prior to the arrival of each piece of equipment on the construction site; the certificate shall remain on the construction site and transmitted to the Departmental representative on demand.
7. Ensure all inspections (daily, periodic, annual, etc.) for the hoisting devices for persons or materials required by the current standards are carried out and be able to provide a copy of the inspection certificates to the Departmental representative on demand.
8. The Departmental representative can at all times, if he suspects a malfunction or the risk of an accident, order the immediate stop of any piece of equipment and require an inspection by a specialist of his choice.
9. The Departmental representative must be consulted for the location of storing gas cylinders and tanks on the construction site.

## **1.12 RISKS INHERENT TO THE WORKSITE**

1. In addition to the risks related to the tasks to be carried out, personnel responsible for the execution of the work on the construction site will be exposed to the following risks, inherent to the area where the work will be executed.
  1. At the worksite there is in particular the presence of the following:
    1. Underground services (electric, gas, vapour, water system, etc.);
    2. Laboratories;
    3. Trees and landscaping to preserve and protect.

2. The Contractor shall process to a risk assessment of the site to validate this information and see if other risks are present on the site. He must include in its prevention program all risks that have been identified.

### 1.13 SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND PUBLIC

1. The worksite will be occupied by employees and/or the public for the entire duration of the work. Although they said persons will not be access to the worksite, the Contractor shall consider the following specific requirements for the protection of employees and / or the public:
  1. At no time will the Contractor access the worksite via the « Chemin des Gouverneurs ». Access to the work site is authorized only via the « boulevard Guillaume-Couture ».
  2. Unless authorized in writing by the Departmental Representative, at no time will the Contractor access the parade ground via the public entrance located near the « canonnière de Gorge » When authorised by the Departmental Representative, safe access will be ensured with a flagperson on site.
  3. As this is a recreational site and some outdoor activities will take place around or near the worksite, the Contractor will pay special attention to the safety of the public near the worksite, especially regarding heavy machinery traffic.
2. These requirements must be included in the Contractor's site-specific safety plan as well as any other measures provided by the Contractor to protect the health and safety of employees and / or the public on the site.

### 1.14 UNFORESEEN HAZARDS

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

### 1.15 PERSON IN CHARGE OF HEALTH AND SAFETY

1. If the construction site meets the requirements of article 2.5.3 of the *Code de la sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry), the Contractor needs to hire a competent person authorized as a safety officer and appoint this person full time from the beginning of the work. This person's tasks shall solely be dedicated to the management of health and safety on the construction site. This safety officer must have the following qualifications:
  1. Have a safety officer certificate issued by the CNESST since at least 5 years;
  2. Have site-related working experience specific to the activities associated with the present project;
  3. Have working knowledge of occupational health and safety regulations in the workplace;
  4. Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter the construction site to perform work;
  5. Be responsible for implementing, enforcing in detail and monitoring site-specific Contractor's Health and prevention program;
  6. Be on construction site at all times during execution of work;
  7. Inspect the work and ensure compliance with all regulatory requirements and those indicated in the contract documents or the site-specific prevention program;
  8. Keep a daily log of actions taken and submitting a copy to Departmental Representative each week;

1. The safety officer's certificate shall be submitted to the Departmental representative before the start of the work.
2. When the hiring of a safety officer is not required or if this person is hired by the Departmental representative, the Contractor shall designate a competent person to supervise and take responsibility for health and safety, no matter the size of the construction site or how many workers are present at the workplace. This person shall be on construction site at all times and be able to take all necessary measures to ensure the health and safety of persons and property at or in the immediate vicinity of the construction site and likely to be affected by any of the work. The Contractor shall submit the name of this person to the Departmental representative before the start of work.

#### **1.16 POSTING OF DOCUMENTS**

1. Ensure applicable items, articles, notices and orders are posted in conspicuous location on construction site in accordance with Acts and Regulations of the Province, and in consultation with Departmental representative.
2. At a minimum, the following information and documents must be posted in a location readily accessible to all workers:
  1. Notice of construction site opening;
  2. Identification of principal contractor;
  3. Company OSH policy;
  4. Site-specific prevention program;
  5. Emergency plan;
  6. Minutes of worksite committee meetings;
  7. Names of worksite committee representatives;
  8. Names of the first-aid attendants;
  9. Action reports and correction notices issued by the CNESST.

#### **1.17 INSPECTION OF THE CONSTRUCTION SITE AND CORRECTION OF NON-COMPLIANCES**

1. Inspect the construction site and complete the construction site inspection checklist and submit it to the Departmental representative in accordance with the article "ACTION AND INFORMATIONAL SUBMITTALS" in this section.
2. Immediately take all necessary measures to correct any situations deemed non-compliant during the inspections mentioned in the previous paragraph or noticed by the authorities having jurisdiction or the Departmental representative or his agent.
3. Submit to Departmental representative written confirmation of all measures taken to correct the situation in case of non-compliance in matters pertaining to health and safety.
4. The Contractor shall give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order cessation and resuming of work as and when deemed necessary or desirable in the interests of safety and health. This person should always act so that the safety and health of the public and construction site workers and environmental protection take precedence over cost and scheduling considerations.
5. The Departmental representative or his agent may order cessation of work if the Contractor does not make the corrections needed to conditions deemed non-compliant in matters pertaining to health and safety. Without limiting the scope of the preceding articles, the Departmental representative may order cessation of work if, in his view, there is any hazard or threat to the safety or health of construction site personnel or the public or to the environment.

### **1.18 PREVENTION OF VIOLENCE**

1. Health and safety management of Public Works and Government Services Canada construction sites includes the implementation of measures designed to protect the psychological health of all persons who access the construction site where the work is taking place. Consequently, in addition to physical violence, verbal abuse, intimidation and harassment are not tolerated on the construction site. Any person who demonstrates such actions or behaviors will receive a warning and/or could be definitely expelled from the construction site by the Departmental representative.

### **1.19 BLASTING**

1. Blasting or other use of explosives at the work site is prohibited.

### **1.20 POWDER ACTUATED DEVICE**

1. Use powder actuated devices only after receipt of written permission from Departmental representative.
2. Any person using an explosive actuated tool shall hold a training certificate and meet all requirements of Section 7 of the *Code de la sécurité pour les travaux de construction* (S- 2.1, r. 4). (Safety code for the construction industry).
3. Any other explosive-actuated device shall be used in accordance with the manufacturer's directions and applicable standards and regulations.

### **1.21 USE OF PUBLIC ROADS**

1. Where it is necessary to encroach on a public road for operational reasons or to ensure the security of the workers, the occupants or the public (for example: the use of scaffolding, cranes, excavation work, etc.), the Contractor shall obtain at his own expense any authorizations and permits required by the competent authority.
2. The Contractor shall install at his own expense any signage, barricades or other devices needed to ensure the safety and security of the public and the Contractor's own facilities.

### **1.22 LOCKOUT-TAGOUT**

1. For all work on electrically or otherwise energized equipment, the Contractor shall draw up and implement a general lockout-tagout procedure and submit it to the Departmental representative.
2. Supervisors and all workers concerned by work requiring lockout-tagout must have received training on lockout-tagout procedures by a recognized organization; Contractor shall submit training certificates to the Departmental representative.
3. Before starting the lockout-tagout procedure of a piece of equipment on an occupied site, Contractor must coordinate his work with the representative of the site if the interruption of the power sources can have an impact on the operations of the site or on its occupants.
4. Contractor must designate a qualified person as responsible for the lockout-tagout and must make sure that that person prepares a lockout-tagout data sheet for each piece of equipment involved. The lockout-tagout data sheet must be submitted to the Departmental representative at least 48 hours before the beginning of the work. The Departmental representative will review the data sheet with the representative of the site if the work takes place in an existing building. The data sheets for lockout-tagout must contain at least the following information:
  1. Description of work to carry out;
  2. Identification, description and location of the circuit and/or equipment to lockout-tagout;

3. Identification of energy sources that feeds the ~~piece of~~ equipment;
  4. Identification of each cutout point;
  5. Sequence of lockout-tagout and the release of residual energy as well as the sequence of unlocking;
  6. List of material needed for the lockout-tagout;
  7. Method of verification of zero energy implementation;
  8. Name and signature of the person who prepared the data sheet.
5. When required by the Departmental representative, Contractor must record all this information on the site's representative form.
  6. At the time of lockout-tagout, the person responsible must date the data sheet and ensure that each worker involved in the work on the circuit/equipment to lockout-tagout puts his name on the data sheet and signs it.

### 1.23 ELECTRICAL WORK

1. Contractor shall ensure that all electrical work is executed by qualified employees in accordance with the provincial regulation respecting vocational training and qualification.
2. Contractor shall respect all requirements of standard CSA Z462 *Workplace Electrical Safety Standard*.
3. No repairs or alterations shall be carried out on any live equipment except where complete disconnection of the equipment is not feasible.
4. Contractor shall respect all requirements prescribed in paragraph "LOCKOUT-TAGOUT" in this section.
5. Contractor shall advise in writing the Departmental representative of all the work that cannot be done with de-energized equipment and obtain his authorization. Contractor shall demonstrate to the Departmental representative that it is impossible to do the work with de-energized equipment and provide all the information necessary to request and obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) before the beginning of the work, excluding for the exceptions indicated in standard CSA Z462 Workplace electrical safety.
6. The energized electrical work permit on must contain at least the following elements:
  1. Description of the circuit and equipment and its location;
  2. Justification for having to do the work in an energized condition;
  3. Description of safe work practices to apply;
  4. Results of the shock hazard analysis;
  5. Limit of the protective perimeter against electric shocks;
  6. Results of the arc flash hazard analysis;
  7. Description of the arc flash protection boundary;
  8. Description of the personal protective equipment required;
  9. Description of the means to limit access to unqualified persons;
  10. Proof that an information session has been carried out;
  11. Approval signature of the energized electrical work (by a person in authority or by the owner).
7. If for the operational requirements of the occupants of the site the representative of the site requires that the Contractor performs work in an energized condition, the Contractor shall obtain all the information required to request and obtain an energized electrical work permit (indicate working procedures, arc flash

hazard analysis, protective perimeter, protective equipment, etc.) and have it signed by the representative of the site assigned by the Departmental representative before the beginning of the work.

#### 1.24 ASBESTOS EXPOSURE

1. It is not anticipated that the work covered by the present specifications involves the manipulation of materials containing asbestos; however, if the Contractor or the Departmental representative or his agent discover materials which are susceptible of containing asbestos, the Contractor must immediately stop the work and advise the Departmental representative. If more investigation demonstrates that the materials do contain asbestos, the Contractor shall comply with the following requirements.
2. Prior to starting any work likely to emit asbestos dust, the Contractor must:
  1. Provide a written procedure for the work, identifying the risk level of the work (low, moderate, high), as defined in section 3.23 of the *Code de sécurité pour les travaux de construction* S-2.1, r-4, (Safety code for the construction industry). This procedure must take into account all the requirements of that section 3.23.
  2. Submit certificates that demonstrate that all workers involved in the work have received training on asbestos hazards and on the procedure required in the preceding paragraph.
  3. Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

#### 1.25 FUNGAL CONTAMINATION

1. It is not anticipated that the work covered by the present specifications involves the manipulation of materials contaminated by mould; however, if the Contractor or the Departmental representative or his agent discover materials which are susceptible of being contaminated by mould, the Contractor must immediately stop the work and advise the Departmental representative. If more investigation demonstrates that the materials do contain mould, the Contractor shall comply with the following requirements.
2. Prior to starting any work where workers are likely to be in contact with materials contaminated by mould, the Contractor must:
  1. Provide a written procedure for the work which respects all the requirements of the *Code de sécurité pour les travaux de construction* S-2.1, r-4, (Safety code for the construction industry), as well as the requirements indicated in the document "Mould Guidelines for the Canadian Construction Industry" published by the Canadian Construction Association (<http://www.cca-acc.com/documents/electronic/cca82/cca82.pdf>).
  2. Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

#### 1.26 EXPOSURE TO SILICA

1. For any interior or exterior work generating silica, the Contractor must respect the following requirements, in addition to those in the *Code de sécurité pour les travaux de construction* S-2.1, r.4 (Safety code for the construction industry).
  1. Work in wet environment or use tools with the inflow of water in order to reduce dustiness, if not, collect dust at the source and retain it with a high-efficiency filters not to propagate dust in the environment.
  2. Clean surfaces and tools with water, never with compressed air.
  3. Sand and pickle surfaces by using an abrasive containing less than 1% of silica (also called amorphous silica).
  4. Install shields or other containment device to prevent silica dust from migrating toward other workers or the public.



5. Wear individual respiratory and ocular protection equipment during all the operations that could generate silica dust in accordance with the requirements of the *Code de sécurité pour les travaux de construction*, S-2.1, r.4 (Safety code for the construction industry).
6. Wear coveralls to prevent contamination outside the construction site.
7. Do not eat, drink, or smoke in a dusty environment.
8. Wash the hands and the face before drinking, eating or smoking.

## 1.27 SANDBLASTING

1. Prior to starting any sandblasting work, the Contractor must:
  1. Provide a written procedure of the work that meets the requirements of section 3.20 of the *Code de sécurité pour les travaux de construction*, S-2.1, r.4 (Safety code for the Construction Industry).
  2. Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.
  3. All sanding and sandblasting work shall be done by using an abrasive containing less than 1% of silica.

## 1.28 LEAD-BASE PAINT REMOVAL

1. It is not anticipated that the work described in these specifications involve the removal of lead-based paint. However, if the Contractor or the Departmental Representative or the latter's representative discover materials likely to be contaminated by lead-based paint, the Contractor will immediately stop the work and notify the Departmental Representative. If it is demonstrated later that the materials do contain lead, the Contractor will comply with the following requirements:
  1. Prior to all work where workers are likely to handle materials containing lead-based paint or other substances containing lead, the Contractor must:
    1. Provide a written procedure for the work which respects all the requirements of the *Code de sécurité pour les travaux de construction* S-2.1, r- 4, (Safety code for the construction industry).
    2. Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

## 1.29 EXPOSURE TO ANIMAL'S FECAL DROPPINGS

1. It is not anticipated that the work described in these specifications involve exposure to animal's fecal droppings. However, if the Contractor or the Departmental Representative or the latter's representative discover exposure to animal's fecal droppings, the Contractor will immediately stop the work and notify the Departmental Representative.
  1. Prior to all work where workers are likely to come in contact with materials contaminated by animal's fecal droppings, the Contractor must:
    1. Provide a written procedure for the work which respects all the requirements of the *Code de sécurité pour les travaux de construction* S-2.1, r- 4, (Safety code for the construction industry), as well as the requirements indicated in the document "Des fientes de pigeons dans votre lieu de travail: méfiez-vous" (Pigeon droppings in your workplace: Beware" published by the CNESST ([http://www.explorationurbaine.ca/Technique/dc\\_100\\_1331.pdf](http://www.explorationurbaine.ca/Technique/dc_100_1331.pdf)).
    2. Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

## 1.30 RESPIRATORY PROTECTION

1. Contractor must ensure that all workers who must wear a respirator as part of their duties have received training for that purpose as well as fit testing of their respirator, in accordance with CSA Standard Z94.4

*Selection, use and care of respirators.* Submit the certificates of the fit testing to the Departmental representative on demand.

### 1.31 FALL PROTECTION

1. Plan and organize work so as to eliminate the risk of fall at the source or ensure collective protection, thereby minimizing the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness that complies with CSA standard CAN/CSA Z-259.10 M90. A safety belt must not be used as fall protection.
2. Every person using an elevating platform (scissors, telescopic mast, articulated mast, rotating mast, etc.) must have a training regarding this equipment.
3. The use of a safety harness is mandatory for all elevating platforms with telescopic, articulate or rotating mast.
4. Define the limits of the danger zone around each elevating platform.
5. All openings in a floor or roof must be surrounded by a guardrail or provided with a cover fixed to the floor able to withstand the loads to which it could be exposed, regardless of the size of the opening and the height of the fall it represents.
6. Everyone who works within two metres from a fall hazard of three metres or more must use a safety harness in accordance with the requirements of the regulation, unless there is a guardrail or another device offering an equivalent safety.
7. Despite the requirements of the regulation, the Departmental representative may require the installation of a guardrail or the use of a safety harness for specific situations presenting a risk of fall less than three metres.

### 1.32 SCAFFOLDINGS

1. In addition to the requirements of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Contractor who uses scaffoldings must respect the following requirements:
  1. Foundation
    1. Scaffoldings shall be installed on a solid foundation so that it does not slip or rock.
    2. Contractors wishing to install scaffoldings on a roof, overhang, canopy or awning shall submit their calculations and loads, as well as plans signed and sealed by an engineer to the Departmental representative and obtain his authorization before beginning installation.
  2. Assembly, bracing and mooring
    1. All scaffoldingS shall be assembled, braced and moored in accordance with the manufacturer's instructions and the provisions of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry).
    2. Where a situation requires the removal of part of the scaffoldings (e.g., crosspieces), the Contractor shall submit to the Departmental representative an assembly procedure signed and sealed by an engineer certifying that the scaffolding assembled in that manner will allow the work to be done safely given the loads to which it will be subject.
    3. For scaffoldings where the span between two supports is greater than three metres, the Contractor shall provide the Departmental representative an assembly plan signed and sealed by an engineer.



3. Protection against falls during assembly
  1. Workers exposed to the risk of falling more than three metres shall be protected against falls at all times during assembly.
4. Platforms
  1. Scaffolding platforms shall be designed and installed in accordance with the provisions of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry).
  2. If planks are used, they shall be approved and stamped in accordance with section 3.9.8 of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry)
  3. ScaffoldingS of four sections (or six metres) high or more shall have a full platform covering the entire surface between the putlogs every three metres high or fraction thereof, and the components of that platform shall not be moved at any time to create an intermediate landing.
5. Guardrails
  1. A guardrail shall be installed on every landing.
  2. Cross braces shall not be considered as guardrails.
  3. If the platforms are not covering the entire surface between the putlogs, the guardrail must be installed just above the edge of the platform so that there is no empty horizontal space between the platform and the guardrail.
  4. Where scaffoldingS has four sections (or six metres) high or more and full platforms are required, the guardrails shall be installed on each landing at the start of work and shall remain in place until the work is completed.
6. Access
  1. The Contractor shall ensure that access to the scaffoldings does not compromise worker safety.
  2. Where the platforms of the scaffoldingS are comprised of planks, ladders shall be installed in such a way that planks extending beyond the platform do not block the way up or down.
  3. Notwithstanding the provisions of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), stairs shall be installed on all scaffoldingS that have six or more rows of uprights or is six sections (or nine metres) high or higher.
7. Protection of the public and occupants
  1. When scaffoldingS are installed in a zone accessible to the public, the Contractor shall take the necessary measures to prevent the public from having access to them and, if applicable, to the work or storage area located in the vicinity of these scaffolding.
  2. Contractor must install covered walkways, nets or other similar devices to protect workers, the public and the occupants against falling objects. The means of protection must be approved by the Departmental representative.
8. Engineering plans
  1. In addition to those required by the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Departmental representative reserves the right to require engineering plans for other types or configurations of scaffoldingS.
  2. A plan signed and sealed by an engineer is required for all scaffoldingS that will be covered with a canvas, a tarpaulin or any other material that has wind resistance.
  3. A certificate of conformity signed by an engineer is required in all cases where an engineering plan is required and this, before anybody uses the facility. A copy of these documents must be available on the construction site at all times.

### 1.33 CONFINED SPACES

1. In addition to the requirements of the provincial regulation applicable to confined spaces, the Contractor must respect the requirements in the following paragraphs.
2. The Departmental representative reserves the right, depending on the nature of the risk of the confined spaces, of the work to be done and/or of the level of competence in confined spaces demonstrated by the Contractor, to require from the latter that he use the services of a firm specialized in health and safety or in confined space work to perform the analysis of the risks inherent to the confined spaces, to complete the entry permit, to conduct surveillance of the work or for any other task related to the work in confined spaces.
  1. Information on confined spaces existing on the construction site
    1. The following presents a non-exclusive list of the confined spaces that the Contractor will likely have to access during this project:
      1. Various manholes during drainage, pipe cleaning and video inspection work.
    2. The Contractor shall take into consideration each of these confined spaces and must also add to this list the confined spaces that he is likely to build/install during this project.
  2. Person in charge of the health and safety for the work in confined spaces
    1. The Contractor shall designate a person to be in charge of the health and safety for the work in confined spaces. This person shall be qualified, as defined in the article 297 of the *Règlement sur la santé et la sécurité du travail* (S-2.1, r.13) (Occupational Health and Safety Regulation). This person must be present at all times during work in confined spaces and must make sure that all the requirements of the regulation and the ones specified in this section are respected. This person must amongst other things fill out and issue the entry permit for the confined spaces.
  3. Training
    1. All persons having access to a confined space, including the person in charge and the watcher of the confined space shall have completed training on entry in confined spaces.
    2. All persons who have to use supplied-air respirator to access the confined spaces shall have completed training on the use of these apparatus.
    3. All persons identified as rescuers for confined spaces shall have completed training on confined spaces rescue.
    4. Each training required in the preceding paragraphs must be provided by a firm specialized in health and safety or in confined spaces.
    5. The training certificates of the persons mentioned above must be submitted to the Departmental representative before the beginning of the work in confined spaces.
  4. Risk assessment of confined spaces
    1. For each of the confined spaces listed at the beginning of this article, the Contractor must obtain the necessary information from the site representative and proceed to the assessment of the risk inherent to each confined space and relative to:
      1. The prevailing internal atmosphere, namely the concentration of oxygen, inflammable gases and vapours, combustible or explosive dusts as well as the categories of contaminants likely to be present in this enclosed area or nearby;
      2. The fact that the natural or mechanical ventilation is insufficient;
      3. The materials that are present there and that can cause the worker to sink, to be buried or to drown, such as sand, grain or a liquid;
      4. The interior configuration;
      5. Pipes and conduits penetrating the confined space;

6. Energies such as electricity, moving mechanical parts, heat stress, noise and hydraulic energy;
  7. Ignition sources such as open flames, lighting, welding and cutting, static electricity or sparks;
  8. All other particular circumstances, such as the presence of vermin, rodents or insects.
2. These risk assessments must be done by the person in charge of the health and safety of the work in confined spaces. They must be submitted to the Departmental representative for analysis at least 10 days before the proposed date for the work in confined spaces and they must also include the following information:
  1. Location of the confined space;
  2. Description of the confined space;
  3. Dimensions of the confined space;
  4. Number, location and dimensions of the openings;
  5. Content of the confined space (material, substances, etc.);
  6. Date of the assessment;
  7. Name and signature of the person who conducted the assessment and the name of his employer.
3. The Contractor must repeat the same process for each of the confined spaces that he will build/install during this project.
5. Confined spaces entry permits
  1. At least 5 days before the scheduled date for the work in a confined space the Contractor must submit for analysis to the Departmental representative a copy of each entry permit specific to the confined spaces where he must access. The entry permits must be completed by the person in charge of the health and safety of the work in confined spaces, and must contain the following information as a minimum:
    1. Description of the work that will be carried out and the method of work, including the materials and tools needed to do this work.
    2. Description of the risks and corresponding preventive measures according to the risk assessment inherent to the confined space done previously and according to the work to be carried out.
    3. Safety equipment that will be used to control the risks of confined spaces (e.g.: fan, gas detectors, local exhaust ventilation, personal protective equipment, etc.).
    4. Rescue procedure covering at least the following:
      1. Means of communication between the supervisor of the confined space and the workers in the confined space.
      2. Lifesaving equipment specific to each confined space.
      3. Confirmation that the municipal emergency response service has been advised that work in confined spaces would be going on at this specific construction site and that they may intervene do to a confined space rescue; otherwise, the contractor must identify the workers on the construction site that will act as rescuers in a confined space in the case where such rescuers must enter the confined space (rescue training is mandatory).
      4. Location of telephone and phone number of the municipal emergency response service (if applicable).
    5. Date of entry permit.
    6. Name of person who issued the permit and the name of his employer.
    7. Name of the confined space safety watcher and the name of his employer.

8. Name of the workers who must enter the confined space and the name of each one's employer.
2. In cases where the site representative requires the use of a confined space entry permit specific to his site, the Contractor must comply with the requirements of that permit.
6. Medical surveillance
  1. The Contractor must submit to the Departmental representative a medical certificate dated in the last two years for all persons who must use a supplied-air respirator. The certificate must confirm the ability of each person to use this type of apparel.
  2. It is recommended that the persons who have to work in sewer collection systems or other similar systems be vaccinated against diphtheria, tetanus and hepatitis "B".
7. Requirements while working in confined spaces
  1. Before each entry into a confined space, the person in charge of the health and safety for the work in confined spaces shall take readings of oxygen concentration, flammable gases and all toxic gases likely to be present and record these readings on the entry permit required earlier.
  2. No worker can access the confined space if the following requirements are not respected:
    1. The concentration of oxygen shall be greater than or equal to 19.5% and less than or equal to 23%;
    2. The concentration of inflammable gases or vapours shall be less than or equal to 10% of the lower explosion limit;
    3. The concentration of other gases must not exceed the standards prescribed in annex i of the *règlement sur la santé et la sécurité du travail* (s-2.1, r.13) (occupational health and safety regulation).
  3. If the oxygen and gas concentrations measured respect the regulatory values, the person in charge of the health and safety for the work in confined spaces must ensure that all preventive measures indicated on the permit are in place and then must complete the entry permit (date, time, signatures, etc.) before issuing the permit and allow entry into the confined space.
  4. A permit is only valid for one work shift; the Contractor must submit a new permit for each extra shift.
  5. During the work inside the confined space, the gas concentration must be measured continuously and the gas detector must be installed at ~~the level of the~~ the breathing area of the workers. If the conditions inside the confined space are such that the workers might not hear/see the detector's alarm, the Contractor must find a way for the confined space safety watcher to watch the concentration measures while maintaining the measurements at the level of the breathing zone of the workers.
  6. If the work is organized in a way that the workers are scattered far away from each other in a large confined space, the Contractor needs to provide additional gas detectors.
  7. The Contractor must provide the gas detectors and maintain them in good condition. He must be able to show that the gas detectors used have been calibrated and adjusted by the person in charge of the health and safety for the work in confined spaces or by a qualified person, in accordance with the manufacturer's recommendations. The Departmental representative can at all times have the accuracy of the measuring devices checked. In the event of the failure of a detection device, the work must be stopped immediately and all workers must leave the confined space.
  8. The manufacturer's manual of the gas detectors must be available on the construction site.
  9. The Contractor shall provide a ventilation system to keep concentrations of contaminants below the regulatory limits.
  10. If work generating contaminants are performed (welding, use of products, etc.), the Contractor must, if needed, install an aspiration system for the contaminants so that the regulatory values of air quality can be maintained at all times.

11. If a detecting device alarm goes off, all workers shall leave the confined space. The measured levels of concentration must then be recorded on the entry permit. The Contractor shall then find the source of contamination, neutralize it, ventilate the confined space to eliminate contaminant residues and authorize access to the confined space only when concentrations of oxygen and gas have returned to normal.
12. Compressed gas cylinders or welding equipment shall not be brought into confined spaces; this equipment shall remain outside and shall not block entrances or exits; all cylinders shall be properly secured.
13. Tools and electrical devices used to work in the confined spaces shall be grounded and, when necessary, designed to be explosion-proof. All equipment must be connected to a ground fault interrupter outlet or to a step-down transformer. The Contractor shall, at his own cost, hire a qualified electrician to adjust power receptacles and/or circuit breakers that he intends to use which do not meet these criteria.
14. The Contractor shall obtain a Hot Work Permit and respect the requirements to that effect when the work to be carried out includes hot work.
15. The Contractor must assign a competent person to assume the duties of confined space safety watcher. The supervisor shall be exclusively dedicated to these duties and must constantly remain outside of the confined space as long as there is a worker in it. He must also:
  1. Ensure that the entry permit has been filled, signed and posted near the confined space;
  2. Be familiar with the work procedure specific to the confined space and ensure that it is respected;
  3. Ensure continuous communication with all the workers in the confined space and ensure that all the equipment required in case of emergency is present;
  4. Have a good knowledge of the ~~backup~~—ventilation systems and ensure their proper functioning for the duration of the work;
  5. Prevent access to unauthorized persons;
  6. Ensure that the conditions around the confined space zone is not a health or security risk for the workers inside the confined space;
  7. Initiate the emergency procedure if needed.
16. The same person may act as a confined space safety watcher and as the person in charge of the health and safety of the work in confined spaces, provided all requirements of both functions are met.

### 1.34 EXCAVATION WORK

1. In addition to the requirements of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Contractor who performs the digging of trenches or excavations must respect the following requirements:
  1. Fill out the following form and submit it to the Departmental representative before beginning to excavation work.
  2. Submit to the Departmental representative, as appropriate, the following documents:
    1. Plans and specifications, signed and sealed by an engineer, of the shoring needed to be installed for the excavation work; or
    2. Engineer's advice specifying the wall angles of the trench or excavation.

## Excavation guidelines

N° \_\_\_\_\_ of \_\_\_\_\_

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

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

**Field survey**

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

**Working method to use**

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

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

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

	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%; text-align: center;">Minimum</th> <th style="width: 35%; text-align: center;">Maximum</th> </tr> </thead> <tbody> <tr> <td>H Depth</td> <td></td> <td></td> </tr> <tr> <td>Wb Width at bottom</td> <td></td> <td></td> </tr> <tr> <td>Width at top</td> <td></td> <td></td> </tr> </tbody> </table>		Minimum	Maximum	H Depth			Wb Width at bottom			Width at top		
	Minimum	Maximum											
H Depth													
Wb Width at bottom													
Width at top													

**Safety measures**

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

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

Name	Occupation	
Signature	Date	Telephone no.

Directive submitted

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

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### 1.35 LIFTING LOADS WITH CRANE OR BOOM TRUCK

- Unless specified otherwise, the Contractor must prepare a hoisting plan and submit it to the Departmental representative for all lifting operations done with a crane or a boom truck at least 5 days before these lifting operations begin. The hoisting plan must contain at a minimum the information listed at the end of this article.

2. The hoisting plan must be signed and sealed by an engineer for the following lifting operations:
  1. Lifting of concrete panels;
  2. Lifting mechanical/electrical equipment on a roof or on the floor of a building;
  3. Lifting of loads encroaching on the public road;
  4. Lifting large dimensions or very heavy loads;
  5. All other lifting operation, in accordance with the requirements of the departmental representative.
3. In addition to the above requirements, the Contractor must plan the hoisting operations in a way as to avoid that the loads pass over the occupied zones on the site. When there is no alternative, the hoisting plan must absolutely be signed and sealed by an engineer and must guarantee the security of the occupants in that zone; the plan must also be approved by the Departmental representative. The Departmental representative can, if he deems necessary, require that the work be done at night or on weekends.
4. Upon the beginning of the work on the construction site, the Contractor must submit the list of the hoisting plans anticipated for the whole project to the Departmental representative. That list shall be updated as needed if changes occur during the work.
5. In addition to the mechanical service inspection certificate, the annual inspection certificate and the crane logbook must be aboard all cranes and boom truck cabs.
6. The entire lifting area shall be marked off to prevent the entry of non-authorized persons.
7. The Contractor shall carefully inspect all of the slings and lifting accessories and make sure that those in poor condition are destroyed and scrapped.
8. Compressed-gas cylinders shall be lifted with a basket specially designed for this purpose.
9. MINIMUM CONTENT OF HOISTING PLAN
  1. Sketch indicating at a minimum, the location of the crane, the surrounding facilities, the zone covered by the hoisting operations, the pedestrian's pathways and vehicular routes, the security perimeter, etc.
  2. Weight of loads.
  3. Dimensions of loads.
  4. List of hoisting devices and weight of each.
  5. Total weight lifted.
  6. Maximum height of obstacles to clear.
  7. Height of loads lifting relative to the surface of the roof (in the case of loads to be placed on roofs).
  8. Use of guide cables.
  9. Type of crane used.
  10. Crane capacity.
  11. Boom length.
  12. Boom angle.
  13. Crane's radius of action.
  14. Deployment of stabilizers.
  15. Percentage usage of the crane's capacity.
  16. Verification confirmation of hoisting equipment.

17. Identification of the crane operator and the person responsible for the hoisting operations with date and signatures.

### 1.36 HOT WORK

1. Hot work means any work where a flame is used or a source of ignition may be produced, i.e., riveting, welding, cutting, grinding, burning, heating, etc.
  1. Before the beginning of each shift of work and for each sector, the Contractor must obtain a "Hot Work Permit" emitted by the person responsible for the site.
  2. A working portable fire extinguisher suitable to the fire risk shall be available and easily accessible within a 5 m radius from any flame, spark source or intense heat.
  3. The Contractor must appoint an individual to do continuous monitoring of the fire risks for a period of one (1) hour after the end of the shift of hot work. This individual shall sign the section for this purpose on the permit and give it to the person in charge of the construction site after the one-hour period.
  4. When the hot work is done in areas where there is combustible materials or where the walls, ceilings or floors are made of or covered with combustible materials, a final inspection of the work area must be scheduled four (4) hours after the work has finished. Unless specified otherwise by the Departmental representative, the Contractor must assign a person to carry out this monitoring.
2. Welding and cutting
  1. In addition to the requirements prescribed in the preceding paragraphs, the Contractor must respect the following requirements:
    1. Welding and cutting work must be carried out in accordance with the requirements of the Code de Sécurité pour les travaux de construction, S-2.1, r.4 (Safety code for the construction industry) and CSA standard W117.2, Safety in Cutting, Welding and Allied Processes.
    2. Air extraction system with filters must be used for all welding and cutting work performed inside.
    3. Stop all activities producing flammable or combustible gas, vapours or dust in the vicinity of the welding or cutting work.
    4. Store all compressed gas cylinder on a fireproof fabric and make sure that the room is well ventilated.
    5. Store all oxygen cylinders more than 6 metres from a flammable gas cylinder (ex: acetylene) or a combustible such as oil or grease, unless the oxygen cylinder is separated from it by a wall made of non-combustible material as mentioned in the article 3.13.4 of the Code de sécurité pour les travaux de construction, S-2, r. 6 (Safety code for the construction industry).
    6. Store the cylinders far from all heat sources.
    7. Not to store the cylinders close to the staircases, exits, corridors and elevators.
    8. Do not put acetylene in contact with metals such as silver, mercury, copper and alloys of brass having more than 65% copper, to avoid the risk of an explosive reaction.
    9. Check that welding equipment with electric arc has the necessary tension and are grounded.
    10. Ensure that the conducting wires of the electric welding equipment are not damaged.
    11. Place the welding equipment on a flat ground away from the bad weather.
    12. Install fireproof canvas when the welding work is done in a superposition and where there is the risk of falling sparks.
    13. Move away or protect the combustible materials which are closer than 15 metres from the welding work.
    14. Prohibition to weld or cut any closed container.
    15. Do not perform any cutting, welding or work with a naked flame on a container, a tank, a pipe or other container containing a flammable or explosive substance unless:



1. they have been cleaned and air samples indicating that work can be done without danger has been taken; and
2. provisions to ensure the safety of the workers have been made.

#### **1.37 ROOFING WORK**

1. Not applicable.

#### **1.38 STEEL STRUCTURE ERECTION OR DISMANTLING WORK**

1. Not applicable.

#### **1.39 WORK NEAR BODIES OF WATER**

1. Not applicable.

#### **1.40 INTERIOR USE OF INTERNAL COMBUSTION ENGINES**

1. Not applicable.

#### **1.41 TEMPORARY HEATING**

1. In addition to respecting section 3.11 of the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.
2. A portable fire extinguisher must be available at all times near the heating units, no matter what type of heating is used.
3. The heating units must always be used in accordance with the manufacturer's specifications.
4. If applicable, the canvas or tarpaulins used next to the heating units must be solidly fixed so as not to be projected on the heaters, on the pipes connected to the heaters or on any other heat source.
5. The gas cylinders must be installed in a way that they are protected from vehicle and other equipment traffic.
6. For the use of heating units other than electric, the Contractor must install a carbon monoxide detector in the work area, next to the heating units and/or the workers, throughout the course of the heating period. The Contractor must immediately apply the corrective measures required to the heating units if the detector's alarm goes off.
7. The Contractor must ensure a minimum surveillance of the heating units outside the hours of work (nights and weekends). He must submit a surveillance plan to the Departmental representative before the use of the heating units.

#### **1.42 WORK NEAR OVERHEAD POWER LINES**

1. Not applicable.

#### **1.43 DIVING OPERATIONS**

1. Not applicable.

#### 1.44 HEALTH AND SAFETY SUBORDINATION AGREEMENT

Project: \_\_\_\_\_ Address: \_\_\_\_\_

##### EXTERNAL CONTRACTOR

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

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

Name of representative: \_\_\_\_\_

Name of business: \_\_\_\_\_

Description of work to be done on the construction site: \_\_\_\_\_

Approximate dates of work (start-end): \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

##### PRINCIPAL CONTRACTOR

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

Name of representative: \_\_\_\_\_

Name of the Principal Contractor's business: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Description of work to be done on the construction site: \_\_\_\_\_

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

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 33 00 – Submittal procedures.
2. Section 01 35 29.06 – Health and safety requirements.
3. Section 01 74 11 – Cleaning.
4. Section 01 74 21 – Construction/demolition waste management and disposal.

### **1.2 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 humankind; or degrade environment aesthetically, culturally and/or historically.
  2. Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
2. Reference Standards:
  1. U.S. Environmental Protection Agency (EPA)/Office of Water:
    1. EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
    2. General construction permit from EPA 2012.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

1. Provide submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
2. Technical data sheets
  1. Submit the required technical data sheets, as well as instructions and literature from the manufacturer regarding the various products used at the construction site. The technical data sheets must include product characteristics, performance criteria, dimensions, limitations, and the type of finish.
  2. Submit two (2) copies of the data sheets required for the Workplace Hazardous Materials Information System (WHMIS), as specified in Section 01 35 29.06 – *Health and Safety Requirements* and in Section 01 35 43 – *Environmental Procedures*.
3. Prior to commencing construction activities or delivery of materials to site, provide Environmental Protection Plan for review and approval by Departmental Representative. Work of any kind at the construction site will not begin without the approval of this plan and the implementation of the mitigation measures listed therein.
4. Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
5. Address topics at level of detail commensurate with environmental issue and required construction task.
6. Include in Environmental Protection Plan, without limitations:
  1. Names of persons responsible for ensuring adherence to Environmental Protection Plan.

2. Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
  3. Descriptions of environmental protection personnel training program.
  4. Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3 requirements.
  5. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
  6. Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.
    1. Ensure plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
  7. Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
    1. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
  8. Spill Control Plan including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
  9. Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
  10. Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
  11. Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
  12. Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
  13. Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
7. A list of mitigation measures to be carried out by the Contractor for the environment protection is annexed to this quote. This list must be fully respected by the Contractor and this one must ensure that it is followed up during the whole period of the works.

#### **1.4 FIRES**

1. Fires and burning of rubbish on site not permitted.
2. Where fires or burning permitted, prevent staining or smoke damage to structures, materials or vegetation which is to be preserved.

#### **1.5 WASTE DISPOSAL**

1. Unless expressly authorized by the Ministry's representative, burying waste material at the construction site is strictly prohibited.

2. Dumping waste or volatile materials, such as mineral essences and oil or paint solvents, in watercourses and in storm and sanitary sewers is strictly prohibited.

## **1.6 DRAINAGE**

1. Provide Erosion and Sediment Control Plan identifying type and location of erosion and sediment controls provided. Ensure plan includes monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3 requirements.
2. Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
3. Provide temporary drainage and pumping required to keep excavations and site free from water.
4. Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
5. Dumping water containing suspended particles from materials in watercourses, sewers and drainage systems is strictly prohibited.
6. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

## **1.7 SITE CLEARING AND PLANT PROTECTION**

1. Protect trees and plants on site and adjacent properties as indicated.
2. Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes.
3. Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
4. Minimize stripping of topsoil and vegetation.
5. Restrict tree removal to areas indicated or designated by Departmental Representative.
6. When trees or shrubs are removed, supply and plant trees and shrubs of the same species and size once the work is finished.

## **1.8 POLLUTION CONTROL**

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

## **1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL**

1. Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical

archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.

2. Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

#### **1.10 NOTIFICATION**

1. Departmental Representative 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 Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
  1. Do not take action until after receipt of written approval by Departmental Representative.
3. Departmental Representative 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 NOT USED**

### **PART 3 - EXECUTION**

#### **3.1 CLEANING**

1. Clean in accordance with Section 01 74 11 - Cleaning.
  1. Leave the premises clean at the end of each work day.
2. Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
3. Final cleaning: Remove materials, surpluses, waste, tools and equipment from the construction site, as specified in Section 01 74 11 - *Cleaning*.
4. Waste management: Sort the waste for reuse/recycling purposes, as specified in Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
  1. Remove the recycling bins from the construction site and dispose of the waste material in appropriate facilities.

**END OF SECTION**

## **ANNEX**

### **MITIGATION MEASURES FOR ENVIRONMENT PROTECTION**

### MITIGATION MEASURES FOR ENVIRONMENT PROTECTION

Work completion date: \_\_\_\_\_  
Monitoring date: \_\_\_\_\_  
Name of the monitor: \_\_\_\_\_

Mitigation Measure	Completed			If no or N/A, please explain:
1. Inspect the machinery and equipment before they are brought to the construction site and maintain them in perfect operating order.	Yes	No	N/A	
2. Use airtight dump trucks equipped with a tarp to avoid cargo losses during transportation and use tarps or other airtight material to store particulates likely to be carried away by wind or rain.	Yes	No	N/A	
3. Restore the site as soon as possible after construction. This includes the cleaning-up of temporary storage areas.	Yes	No	N/A	
4. Verify the presence of contaminant leaks from machinery and equipment daily. Leaky machinery or equipment will be repaired immediately or removed from the construction site.	Yes	No	N/A	
5. Restrict machinery traffic to specific routes (planned pathways) inside the intervention areas.	Yes	No	N/A	
6. Identify and use an isolated temporary storage site at the construction site for the material and, if necessary, for fuel, oil and other petroleum products or contaminants. The storage site will be located where there will be no risk of contaminating the receiving environment, more than 30 m from the latter and in a low gradient area.	Yes	No	N/A	



Mitigation Measure	Completed			If no or N/A, please explain:
7. The general maintenance of the material will be monitored constantly in order to avoid accidental spills. Maintenance will be carried out in areas designated for this purpose, where there will be no risk of contaminating the receiving environment and more than 30 m from the latter.	Yes	No	N/A	
8. Plan for a complete spill response kit at the construction site on a permanent basis. Workers will have received appropriate spill response training.	Yes	No	N/A	
9. Plan for the implementation of an emergency response plan in case of accidental contaminant spill. Identify the contact persons and authorities, as well as the procedure to follow during environmental emergencies. In case of a spill, call Environment and Climate Change Canada's National Environmental Emergencies Centre (1-866-283-2333) and the "ministère du développement durable, de l'Environnement et de la Lutte contre les changements climatiques" or MDDELCC (the Quebec government authority on the environment) at 1-866-694-5454).	Yes	No	N/A	
10. Should a hydrocarbon spill occur, or if any another harmful substance is spilled, stop the spill and confine the spilled product as soon as possible. The developer will then recover the product and restore the area.	Yes	No	N/A	
11. Reduce dispersion and contamination through proper equipment cleaning.	Yes	No	N/A	
12. Ensure that the equipment provided to the workers (chemical toilets, etc.) is installed properly at the site in accordance with the regulations in force.	Yes	No	N/A	
13. Ensure that all materials or waste produced during work is adequately recovered and disposed of.	Yes	No	N/A	
14. At the end of construction, if necessary, stabilize the soil in intervention areas where risks of erosion are present.	Yes	No	N/A	
15. Use equipment that is in good working order.	Yes	No	N/A	

Mitigation Measure	Completed			If no or N/A, please explain:
16. Respect municipal regulations regarding noise and nuisances.	Yes	No	N/A	
17. Manage the construction site so that work generating high noise levels is reduced	Yes	No	N/A	
18. In order to restrict exhaust gas emissions, equipment will not be running when not in service.	Yes	No	N/A	
19. Ensure that fine particulates and residues used for construction are controlled during transportation (trucks equipped with tarps for dust control.	Yes	No	N/A	
20. Restrict the working area in order to avoid altering the plants around the intervention areas.	Yes	No	N/A	
21. Concentrate machinery traffic to specific routes (planned pathways) inside the intervention areas.	Yes	No	N/A	
22. Limit and restrict excavation areas to a strict minimum based on project needs.	Yes	No	N/A	
23. Use existing accesses, when possible. If not, choose and mark the accesses that reduce environmental impacts.	Yes	No	N/A	
24. Plan storage sites based on lack of vegetation or the least environmental impacts.	Yes	No	N/A	
25. Soil brought to the construction site will be free of contaminants and plant seeds from invasive species.	Yes	No	N/A	
26. Prohibit machinery and vehicular traffic outside of the construction area.	Yes	No	N/A	
27. Repair the work areas at the closure of the construction site and plant indigenous vegetation.	Yes	No	N/A	
28. Branches and trees will be cut as close to the ground or stem as possible.	Yes	No	N/A	
29. Tree trunks and other recovered material will be transported to a storage site without spreading debris and without damaging standing trees or landscaping elements outside of limits indicated for deforestation or storage.	Yes	No	N/A	

Mitigation Measure	Completed			If no or N/A, please explain:
30. If grubbing is required, the stumps, roots, trunks and debris other than soil will be removed and shaken in order to remove soil and loose stones prior to transportation to a designated site.	Yes	No	N/A	
31. Plant debris will be removed from rights-of-way as soon as possible and transported outside of the site for disposal.	Yes	No	N/A	
32. Store removed plants in areas already disturbed in order to reduce the surface of disturbed areas.	Yes	No	N/A	
33. Establish and delineate protection areas around the trees and shrubs to be preserved (ribbons, barriers, burlap wraps, etc.), in order to avoid damaging or affecting the root systems, trunks and branches.	Yes	No	N/A	
34. Upon arrival at the construction site, ensure that machinery is clean and free of exotic invasive plant species and harmful weeds and make sure it remains clean afterward.	Yes	No	N/A	
35. Prior to construction, qualified personnel will verify the absence of bird nests in the areas affected by construction.	Yes	No	N/A	
36. Prior to construction, qualified personnel will verify the absence of burrows in the areas affected by construction.	Yes	No	N/A	
37. Flagpersons will protect the construction site's main accesses.	Yes	No	N/A	
38. Noisy work at the construction site will be carried out only between 7:00 AM to 5:00 PM.	Yes	No	N/A	
39. Install adequate signs around the construction site to inform users and tourists that the sidewalk and pedestrian crossing are closed.	Yes	No	N/A	
40. Secure the site during events taking place near the work area.	Yes	No	N/A	
41. Establish storage areas in locations that are not highly visible.	Yes	No	N/A	

Mitigation Measure	Completed			If no or N/A, please explain:
42. At the end of every workday, store machinery and equipment in fenced areas.	Yes	No	N/A	
43. Ensure the presence of a supervising archeologist during excavation work.	Yes	No	N/A	

Comments
(field observations, deficient waste management, oil leaks, presence of waste oil, work executed or mitigation measures not taken into consideration in the context of the environmental assessment , etc.)

Environmental Monitoring
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Prepared by:	
Date:	
Project:	
Organisation:	
Telephone number:	

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Related specification sections:
  1. Section 01 29 83 – Payment Procedures for Testing Laboratory Services.
  2. Section 04 03 08 – Historic – Mortaring.
2. Requirements specifically related to inspection and testing by a laboratory designated by the Departmental Representative are included in various sections of the specifications.

### **1.2 INSPECTION**

1. Allow Departmental Representative 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 Departmental Representative 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. Departmental Representative 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, Departmental Representative shall pay cost of examination and replacement.

### **1.3 INDEPENDENT INSPECTION AGENCIES**

1. Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
2. The Departmental Representative will designate the laboratory that will perform the testing and will pay for their services, with the exception of the following cases, which will be paid for by the General Contractor:
  1. The inspection and testing required by law, decrees, regulations or instructions of a public nature.
  2. The inspection and testing performed exclusively at the convenience of the General Contractor.
  3. Additional testing specified in Paragraph 1.3.3.
3. When the tests or inspections by testing laboratories show the non-conformity of the work *versus* the requirements of the contract, the General Contractor must pay for the additional fees that may be demanded by the Departmental Representative in order to verify the acceptability of the corrective actions.
4. Provide equipment required for executing inspection and testing by appointed agencies.
5. Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
6. 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

Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

#### **1.4 RESPONSIBILITIES OF THE GENERAL CONTRACTOR**

1. Provide the labour and necessary facilities to:
  1. Allow access to the structures for inspection and testing.
  2. Facilitate inspection and testing.
  3. Return the structures affected by inspection and testing to their original condition.
  4. Provide a room on the construction site where laboratory personnel will store materials and process the samples.
2. Notify the Departmental Representative sufficiently in advance of operations to allow him to schedule meetings with the laboratory personnel and establish a testing schedule.
3. When materials must be tested, ship the required quantity of representative samples to the testing laboratory.
4. Assume the expenses related to the work required to uncover the structures that were protected before inspection or testing has been approved by the Departmental Representative, and to their subsequent covering afterward.

#### **1.5 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.

#### **1.6 PROCEDURES**

1. Notify appropriate agency and Departmental Representative 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.

#### **1.7 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 Departmental Representative 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 Departmental Representative 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 Departmental Representative.

## **1.8 REPORTS**

1. Submit three (3) copies of inspection and test reports to Departmental Representative.
2. Provide copies to subcontractor of work being inspected or tested manufacturer or fabricator of material being inspected or tested.

## **1.9 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 Departmental and may be authorized as recoverable.

## **1.10 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 acceptable to Departmental Representative as specified in specific Section.
3. Prepare mock-ups for Departmental Representative 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. If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
6. Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.
7. Mock-ups may remain as part of Work.
8. Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

## **1.11 MILL TESTS**

1. Submit mill test certificates as required of specification Sections.

## **1.12 EQUIPMENT AND SYSTEMS**

1. Submit adjustment and balancing reports for mechanical, electrical and other control systems.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 33 00 – Submittal procedures.
2. Section 01 35 43 – Environmental procedures.
3. Section 01 52 00 – Construction facilities.
4. Section 01 56 00 – Temporary barriers and enclosures.

### **1.2 REFERENCES**

1. 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 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.4 INSTALLATION AND REMOVAL**

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

### **1.5 DEWATERING**

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

### **1.6 POWER SUPPLY**

1. **Power will not be supplied to the construction site. The Contractor will make arrangements to support his own needs in order to complete the work.**

### **1.7 WATER SUPPLY**

1. Water will not be supplied to the construction site. The Contractor will make arrangements to support his own needs in order to complete the work.

### **1.8 TEMPORARY HEATING**

1. The Contractor will plan the use of temporary heating devices in order to execute the work, including (without being limited to) masonry work and the reconstruction of the scarp walls. He will also ensure the operation of the heating devices and supply the fuel necessary for their operation.

### **1.9 TEMPORARY HEATING AND VENTILATION**

1. Not used.



#### **1.10 TEMPORARY POWER, LIGHT AND TEMPORARY HEATING**

1. Not used.

#### **1.11 TEMPORARY COMMUNICATION FACILITIES**

1. Not used.

#### **1.12 FIRE PROTECTION**

1. Not used.

### **PART 2 - PRODUCTS**

#### **2.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 14 00 – Work restrictions.
2. Section 01 33 00 – Submittal procedures.
3. Section 01 51 00 – Temporary utilities.
4. Section 01 56 00 – Temporary barriers and enclosures.

### **1.2 REFERENCES**

1. Canadian Standards Association (CSA International)
  1. CAN/CSA-S269.2-FM1987 (C2003), Access Scaffolding for Construction Purposes.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.4 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.

### **1.5 SCAFFOLDING**

1. Scaffolding in accordance with CAN/CSA-S269.2 and according to the current regulations and laws.
2. Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs.
3. The scaffolding must be approved and sealed by an engineer who is a member of the “Ordre des Ingénieurs du Québec” (Quebec order of engineers).

### **1.6 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.

## **1.7 ELEVATORS**

1. Not used.

## **1.8 SITE STORAGE/ACCEPTABLE LOADS**

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. There will be no surcharge related to the storage of material or machinery in a 2 m wide strip of land following the profile of the top of the curtain wall and of the left flank order not to damage them. Any damage to these walls during construction will be repaired by the General Contractor at his own expense, to the entire satisfaction of the Departmental Representative.
4. Regarding the two posterns of the curtain wall, the Contractor will not be permitted to store material above the vaults. However, he will be permitted to circulate with machinery. The maximum load acceptable on top of the two posterns is 7.2 kPa and this includes machinery traffic on the posterns and any other additional weight, e.g. a temporary stoke bank, that the Contractor will wish to place above the structures.
5. If the storage areas available at the worksite are not sufficient to meet the needs, the Contractor will plan for storage outside of the construction site. The expenses related to the offsite storage will be included in the Contractor's site organization.

## **1.9 SITE ACCESS**

1. Refer to the plans regarding site access conditions.
2. Develop and maintain convenient access to the construction site areas.
3. Refer to item 1.2 of section 01 14 00.

## **1.10 PARKING AND ACCESS TO THE CONSTRUCTION SITE**

1. At all times, the General Contractor will provide two (2) parking spaces exclusively reserved for the Departmental Representative and his guests.
2. When needed, the Contractor may use a maximum of two (2) parking spaces for his own needs.
3. Parking spaces will not be assigned for the Contractor's employees other than for the parties mentioned above.
4. Provide and maintain adequate access to project site.
5. Clean runways and taxi areas where used by General Contractor's equipment.
6. Consult the plans to familiarize yourself with the conditions regarding access to the construction site.
7. Maintain access for fire control purposes. Also anticipate means to fight fire for the entire duration of the work.

### **1.11 SECURITY**

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

### **1.12 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.
4. Provide the Departmental Representative with a heated, air conditioned and furnished (chairs, table, etc.) construction site trailer equipped with internet access.

### **1.13 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. Leave the materials that do not require shelter from the weather on site, but make sure that they will hinder construction as little as possible.
3. The Contractor will pay for the storage of the material belonging to the Departmental Representative that must be temporary relocated during the work, with the exception of furniture. Prior to the beginning of the work, the Contractor must inform the Department Representative of the location where he intends to store the material prior to its return at the end of the work, for approval. The selected location must be clean, tidy and safe in order to ensure the return of the material in its original condition. The Contractor will be held responsible for any damage to the material and will pay for replacements at the satisfaction of the Departmental Representative, if applicable.
4. The Contractor must maintain access to the storage areas and will be held responsible for damages he may cause.

### **1.14 SANITARY FACILITIES**

1. Provide sanitary facilities for work force in accordance with governing regulations and ordinances. The Contractor must provide and be responsible for his own public sanitary.
2. Post the required signs and notifications and take all necessary precautions required by the local sanitary authorities. Keep the facilities and areas clean.

### **1.15 PROTECTION AND MAINTENANCE OF TRAFFIC**

1. Provide access and temporary relocated roads as necessary to maintain traffic.
2. Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
3. Comply with the requirements and recommendation of competent authorities regarding the occupation of traffic lanes, including partial occupation for the delivery of material.

4. Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.
5. Protect travelling public from damage to person and property.
6. General Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
7. Verify adequacy of existing roads and allowable load limit on these roads. General Contractor: responsible for repair of damage to roads caused by construction operations.
8. Construct access and haul roads necessary.
9. Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
10. Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
11. Dust control: adequate to ensure safe operation at all times.
12. Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
13. Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
14. Provide snow removal during construction and pay for the removal of the snow from the construction site.
15. Remove, upon completion of work, haul roads designated by Departmental Representative.
16. Coordinate all of the traffic protection and management activities with competent authorities (City of Quebec, CCBN, etc.).
17. Refer to Part 1 of section 01 56 00 - *Temporary Barriers and Enclosures* regarding the organization of the vehicular and pedestrian traffic.

#### **1.16 ANTI-INTRUSION ALARM SYSTEM**

1. Not used.

#### **1.17 ELECTRIC PANEL**

1. Not used.

#### **1.18 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.

5. The Contractor will clean the streets outside of the construction site where trucks circulated, e.g. the entire CCBN area, including "avenue Georges-VI", "Grande-Allée" in front of the construction site, the "rue Saint-Louis area, the "Côte de la Citadelle", etc.). Cleaning will be carried out with a mechanical broom when there will be dirt deposits on the pavement. At least one daily cleaning with a mechanical broom and one weekly cleaning with water will be carried out.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 14 00 – Work restrictions.
2. Section 01 51 00 – Temporary utilities.
3. Section 01 52 00 – Construction facilities.
4. Section 01 74 21 – Construction/demolition waste management and disposal.

### **1.2 INSTALLATION AND REMOVAL**

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

### **1.3 FENCES AND GATES**

1. The construction site will be enclosed with a 2400 mm high OMEGA-type temporary construction site fence reinforced with stiffeners and concrete blocks every two (2) fence section. The Contractor will submit a drawing showing the installation method prior to construction.
2. The Contractor will validate the position of the fences and barriers with the Departmental Representative at the construction site prior to installation.
3. For the entire duration of construction, Parks Canada will carry out interpretation activities at the site via the installation of banners on the construction fences. The postings will be provided by the Contractor, but Parks Canada will provide the graphic design via a computer medium. The Contractor will provide the material for installation.
4. All of the fences around the construction site will be made to display 8 ft high banners. The access doors to the construction site, as well as the openings required for the smooth operation of the site, will not need banners. Plan the installation of the banners in coordination with a representative of Parks Canada. The graphic design of the banners will be provided by Parks Canada via a computer medium.
  1. Technical specifications for the banners:
    1. MESH material displaying the printed design provided by Parks Canada.
    2. Perforations: 60% printable, 40% air circulation.
    3. Dimensions: 96 inches high X the length of the fence sections to cover.
    4. Matte finish.
    5. Hemmed and double stitched.
    6. For outdoor use.
    7. Fastening system: eyelets every 12 or 24 inches (as recommended by the manufacturer).
    8. The banners or posts will be given back to Parks Canada at the end of construction.
5. Provide a 1 m X 1 m printed sample for approval by Parks Canada prior to the final printing of the complete product.

6. The "Festival d'été de Québec" (summer festival organization) is authorised to post signs on the construction site fences, the surface of which will be defined during construction. Prior to the summer festival, representatives of the organization will remove the nets installed by the Contractor and handed to the latter, who will store them to protect them from damage. The festival organization will install their signs on the construction site fence. When the festival will be over, the Contractor will hand the net to the festival representatives so that they can remove their signs and reinstall the nets. The Contractor will make sure that the nets are reinstalled by the festival organization in accordance with the requirements. The work will be executed as instructed by the Departmental Representative. The Contractor will take into account that this work will be executed in 2017 and 2018.
7. The Departmental Representative reserves the right to modify the perimeter of the site enclosure, if required, during the work, at the expense of the General Contractor.
8. The General Contractor will maintain this temporary fence and make necessary repairs during the work specified in the contract. This includes the replacement of any damaged part and related paint work.
9. The temporary fences will comply with the municipal regulations or other regulations in effect.
10. Install fences around the trees and shrubs to be saved in order to protect them against damages caused by the material used or by some construction method.
11. Anticipate the installation of lockable access gates and ensure protection against intrusion during the work.

#### **1.4 GUARD RAILS AND BARRICADES**

1. Provide secure, rigid guard rails and barricades around deep excavations and anywhere there is a risk of falling.
2. Provide as required by governing authorities ("Commission de la santé et de la sécurité au travail", etc.).

#### **1.5 WEATHER ENCLOSURES**

1. If weather tight closures are installed to protect against the weather or to execute masonry work in cold weather, the Contractor will be responsible for the design and fabrication of these structures and will ensure that they can sustain loads related to snow and wind. The shelters will be headed with temporary heating devices and the openings will be adequately sealed in order to maintain the interior temperature within the acceptable ranges required in various sections of these specifications.

#### **1.6 PROTECTION AGAINST INTRUSION**

1. The fences and gates will have to be sturdy and ensure protection against vandalism and intrusion by the public.
2. Provide the Departmental Representative with an intrusion protection plan prior to the beginning of the work.

#### **1.7 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.
3. If needed, provide screens for the construction site fences in order to protect the public.



## **1.8 ACCESS TO SITE**

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

## **1.9 VEHICULAR AND PEDESTRIAN TRAFFIC**

1. At all times, the vehicular and pedestrian traffic must meet the needs of the Departmental Representative.
2. Anticipate the implementation of measures to protect and divert vehicular and pedestrian traffic, as well as the services of supervisors and flagpersons for the entire construction site, and of policemen if work encroaches on public ways, if required.
3. Respect the requirements for the occupation of the traffic lanes and sidewalks specified in section 01 14 00 - Work Restriction. In addition, organize the construction site in accordance with the layout of the construction site and outdoor temporary facilities of section 01 52 00 - Construction Facilities.
4. At all times, the General Contractor is responsible for the design, organization and coordination, at his own expense, of the vehicular and pedestrian traffic with relevant authorities during the work. It is therefore the responsibility of the General Contractor to organize and plan the presence of police services for the work execution when the authorities require police presence.

## **1.10 WORK SIGNAGE**

1. The constraints regarding the occupation of roads and sidewalks will be respected as per the provisions of section 01 14 00.

## **1.11 ACCESS ROADS FOR EMERGENCY VEHICLES**

1. Ensure access to the construction site for emergency vehicles and anticipate appropriate height clearances.

## **1.12 PROTECTION OF NEARBY PUBLIC AND PRIVATE PROPERTY**

1. Protect surrounding private and public property from damage during performance of Work.
2. Be responsible for damage incurred.
3. All of the elements near the “Croix du Sacrifice” monument and outside of the construction site fences are to be preserved and protected during Contractor mobilization. In case of damage, the initial elements will be reproduced (types of plants, number of plants, plant shapes, etc.). The Contractor will carry out photographic and video surveys of the entire sector prior to the beginning of construction.

## **1.13 PROTECTION OF FINISHED SURFACES AND ARCHITECTURAL, MECHANICAL, ELECTRIC AND OTHER ELEMENTS**

1. All existing elements are to be removed, protected and reinstalled after construction.
2. Existing commemorative plates, identification panels and various other signs are to be removed and transported to a Parks Canada shop (located at 280 “rue St-Dominic”). The Contractor will take them out of storage prior to the end of construction for reinstallation.

#### **1.14 WASTE MANAGEMENT AND DISPOSAL**

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

### **PART 2 - PRODUCTS**

#### **2.1 NOT USED**

### **PART 3 - EXECUTION**

#### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Refer to the project's specifications.

### **1.2 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.

### **1.3 MATERIALS**

1. Required for original installation.
2. Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

### **1.4 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.

## **1.5 EXECUTION**

1. Execute cutting, fitting, and patching, including excavation and fill, to complete Work.
2. Fit several parts together, to integrate with other Work.
3. Uncover Work to install ill-timed Work.
4. Remove and replace defective and non-conforming Work.
5. Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
6. Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
7. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
8. Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
9. Restore work with new products in accordance with requirements of Contract Documents.
10. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
11. Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
12. Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

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

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 74 21 - construction/demolition waste management and disposal.

### **1.2 PROJECT CLEANLINESS**

1. Maintain Work in tidy condition, free from accumulation of waste products and debris, including other than that caused by Owner or other Contractors.
2. Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
3. Clear snow and ice from access to building, bank/pile snow in designated areas only in areas indicated by the Departmental Representative or remove snow from site if the Departmental Representative does not authorize snow banking/stockpiling.
4. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
5. Provide on-site containers for collection of waste materials and debris.
6. Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
7. Dispose of waste materials and debris at designated dumping areas on Crown property off site.
8. Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
9. Store volatile waste in covered metal containers, and remove from premises at end of each working day.
10. Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
11. Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
12. Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
13. The Contractor will clean the route taken by Contractor. See 01 52 00, section 1.18.5 for details.

### **1.3 FINAL CLEANING**

1. When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
2. Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

3. Prior to final review remove surplus products, tools, construction machinery and equipment.
4. Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
5. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
6. At the end of construction, the Contractor will clean and carry out a video inspection of all of the drains, downspouts, and barbicans. The Contractor will also inspect the pipes using video or photographic equipment, or any other similar devices. The Departmental Representative will be provided with three (3) copies of the inspection findings. The Departmental Representative will carry out quality control activities. The tests will be conducted in accordance with the latest edition of the BNQ 1809-300/R2007 standard.

#### **1.4 WASTE MANAGEMENT AND DISPOSAL**

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

### **PART 2 - PRODUCTS**

#### **2.1 NOT USED**

### **PART 3 - EXECUTION**

#### **3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 WASTE MANAGEMENT GOALS**

1. Accomplish maximum control of solid construction waste.
2. Preserve environment and prevent pollution and environment damage.

### **1.2 RELATED REQUIREMENTS**

1. Section 01 33 00 – Submittal procedures.
2. Section 01 74 11 – Cleaning.

### **1.3 DEFINITIONS**

1. 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. Recycling: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products. Recycling does not involve combustion, incineration or destruction of waste through heat.
  5. Recycling: Operations encompassing the sorting, cleaning, treatment and reconstitution of solid wastes and other discarded materials or materials intended to promote their use in a form different from their original state. Recycling does not include combustion, incineration or thermal destruction of waste.
  6. Re-utilization/re-use: Repeated use of a product or material in its original form for the purpose of using it in a different context in the case of re-utilization or in a similar context in the case of re-use. Re-utilization/re-use involves the following:
    1. The recovery of products and materials from the rehabilitation or modernization of a structure which can be re-utilized or re-used, before they are demolished, for the purpose of selling them, re-utilizing them, re-using them in the context of the same project, or storing them for subsequent use.
    2. Return of products or materials that can be re-used by suppliers, such as pallets and unused products.
  7. Recovery: Removal of components and construction materials, load bearing or not, during the deconstruction or dismantling of industrial, commercial or institutional structures, for the purpose of re-utilizing or re-using them or recycling.
  8. Separate Condition: refers to waste sorted into individual types.
  9. Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
2. References
  1. Public Works and Government Services Canada (PWGSC)
    1. National protocol for the management of non-hazardous solid waste from construction, renovation and demolition work, 2002.

2. Market research report on construction, renovation and demolition waste management (available from the PWSGC's Environmental Services Directorate).
3. Sustainable development strategy 2007-2009: Target 2.1, Sustainable use of natural resources.
  1. For real estate projects of more than one million dollars in communities where industrial recycling is available, CRD waste management practices will be implemented to re-use/re-utilize or recycle waste.
  2. Make sure that under the contract, the resources used for construction or maintenance are used and recovered in a sustainable manner.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

1. Submittals in accordance with Section 01 33 00 - *Submittal Procedures*.

#### **1.5 SORTING OF WASTE**

1. Place the containers in locations where it will be easy to deposit waste without hindering the activities of the construction site.
2. Waste materials must be collected, handled and stored on the construction site, then removed after sorting.
3. Recovered waste materials must be transported to approved and authorized recycling facilities.

#### **1.6 USE OF SITE AND FACILITIES**

1. Execute the work while disturbing the normal use of the site as little as possible.
2. Maintain in effect the safety measures established for the facility. Implement temporary safety measures approved by the Departmental Representative.

#### **1.7 WASTE PROCESSING SITES**

1. The Contractor is responsible for finding resources regarding waste reclamation, as well as service providers. Recuperated waste must be transported to approved and/or authorized recycling facilities or to material recyclers.

#### **1.8 STORAGE, HANDLING AND PROTECTION**

1. Unless specified otherwise, materials for removal do not become Contractor's property.
2. Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
3. Protect structural components not removed for demolition from movement or damage.
4. Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
5. Protect surface drainage, mechanical and electrical from damage and blockage.
6. Separate and store materials produced during dismantling of structures in designated areas.
7. Material will be stocked as instructed by the Departmental Representative.



8. Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  1. On-site source separation is recommended.
  2. Remove co-mingled materials to off-site processing facility for separation.
  3. Provide waybills for separated materials.
  4. The materials re-used/re-utilized on site are considered reclaimed and that they must be included in reports.

## **1.9 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. Remove materials from deconstruction as deconstruction/disassembly Work progresses.
4. Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

## **1.10 SCHEDULING**

1. Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 CLEANING**

1. Cleaning during the work: Carry out cleaning activities in compliance with section 01 74 11 - *Cleaning*.
  1. Leave the site clean at the end of each workday.
  2. Provide containers on site for the removal of debris and waste materials.
  3. Remove the debris and waste materials from the site at the end of each work shift.
  4. Take the waste and demolition materials to a site approved by competent authorities.
  5. Provide the Departmental Representative with the bills of lading from the waste disposal site regarding the construction material.
2. Final cleaning: Remove materials, surplus materials, waste, tools and equipment from the construction site in accordance with section 01 74 11 - *Cleaning*.
3. Waste management: Sort the waste for the purpose of re-utilization/re-use and recycling, in compliance with this section.
  1. Remove the recycling bins from the construction site and dispose of the materials at the appropriate facilities.
  2. Sort the waste material that will be re-used/re-utilized or recycled at the source and place them at the specified locations.

4. Handle waste that cannot be reused, recycled or recuperated in accordance with the relevant codes and regulations in force.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 74 11 – Cleaning.
2. Section 01 74 21 – Construction/demolition waste management and disposal.

### **1.2 REFERENCES**

1. Canadian Environmental Protection Act (CEPA).

### **1.3 ADMINISTRATIVE REQUIREMENTS**

1. Acceptance of Work Procedures :
  1. Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents:
    1. Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    2. Request Departmental Representative inspection.
2. Departmental Representative Inspection:
  1. Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
  2. Contractor to correct Work as directed.
3. Completion Tasks: submit written certificates in French that tasks have been performed as follows:
  1. Work: completed and inspected for compliance with Contract Documents.
  2. Defects: corrected and deficiencies completed.
  3. Equipment and systems: tested, adjusted and balanced and fully operational.
  4. Certificates required by Utility companies: submitted.
  5. Work: complete and ready for final inspection.
4. Final Inspection:
  1. When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
  2. When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
5. Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
6. Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

7. Final Payment:

1. When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
2. When Work deemed incomplete by Departmental Representative complete outstanding items and request re-inspection.

**PART 2 - PRODUCTS**

**2.1 NOT USED**

**PART 3 - EXECUTION**

**3.1 NOT USED**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 33 00 - Submittal procedures.
2. Section 01 45 00 - Quality control.

### **1.2 ADMINISTRATIVE REQUIREMENTS**

1. Pre-warranty Meeting:
  1. Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative:
    1. Verify Project requirements.
    2. Review manufacturer's installation instructions and warranty requirements.
  2. Departmental Representative to establish communication procedures for:
    1. Notifying construction warranty defects.
    2. Determine priorities for type of defects.
    3. Determine reasonable response time.
  3. Contact information for bonded and licensed company for warranty work action: provide name, phone number and address of company authorized for construction warranty work action.
  4. Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

1. Provide submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
2. For each of the disciplines involved in the project, submit a copy of the plans showing all of the modifications to the plans in red to the Departmental Representative. These annotations must be signed and dated on each sheet.
3. Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
4. Provide evidence, if requested, for type, source and quality of products supplied.

### **1.4 FORMAT**

1. Organize data as instructional manual.
2. Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
3. When multiple binders are used correlate data into related consistent groupings.
  1. Identify contents of each binder on spine.
4. Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
5. Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.

6. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
7. Text: manufacturer's printed data, or typewritten data.
8. Drawings: provide with reinforced punched binder tab.
  1. Bind in with text; fold larger drawings to size of text pages.
9. Provide scaled CAD files in dxf dwg format on CD.

## **1.5 CONTENTS - PROJECT RECORD DOCUMENTS**

1. Table of Contents for Each Volume: provide title of project:
  1. Date of submission.
  2. Name, address and telephone number of the Departmental Representative and General Contractor, as well as the names of their representatives.
  3. A list of products and systems, indexed according to the content of the volume.
2. For each product or system:
  1. List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
3. Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
4. Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
5. Typewritten Text: as required to supplement product data:
  1. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - *Quality Control*.

## **1.6 AS -BUILT DOCUMENTS AND SAMPLES**

1. Maintain, in addition to requirements in General Conditions, at site for Departmental Representative 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. Field test records.
  7. Inspection certificates.
  8. Manufacturer's certificates, including the applicable warranties.
2. Store record documents and samples in field office apart from documents used for construction.
  1. 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.

1. Label each document "PROJECT RECORD" in neat, large, printed letters.
4. Maintain record documents in clean, dry and legible condition.
  1. Do not use record documents for construction purposes.
5. Keep record documents and samples available for inspection by Departmental Representative.

## **1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

1. Record information on set of blue line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
2. Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
3. Record information concurrently with construction progress.
  1. 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 of elements of foundation in relation to finish first floor datum.
  2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  3. Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  4. Field changes of dimension and detail.
  5. Changes made by change orders.
  6. Details not on original Contract Drawings.
  7. References to related shop drawings and modifications.
5. Specifications: 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, field test records, required by individual specifications sections.
7. Provide digital photos, if requested, for site records.
8. Provide the Departmental Representative with an original copy of all annotated construction site documents, as prescribed.

## **1.8 MATERIALS AND FINISHES**

1. Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  1. Provide information for re-ordering custom manufactured products.
  2. Following the paint work, provide the Departmental Representative with all of the colour codes and paint brands used at the various locations.
  3. Following the installation of the carpets, provide the Departmental Representative with all of the colour codes and products used at the various locations.

2. Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
3. Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
4. Additional requirements: as specified in individual specifications sections.

## **1.9 DELIVERY, STORAGE AND HANDLING**

1. Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
2. Store in original and undamaged condition with manufacturer's seal and labels intact.
3. Store components subject to damage from weather in weatherproof enclosures.
4. Store paints and freezable materials in a heated and ventilated room.
5. Remove and replace damaged products at own expense and for review by Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 14 00 - Work Restrictions.
2. Section 01 33 00 - Submittal Procedures.
3. Section 01 35 43 - Environmental Procedures.
4. Section 01 56 00 - Temporary Barriers and Enclosures.
5. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **1.2 REFERENCES**

1. Definitions
  1. Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
  2. Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
  3. Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.
2. References
  1. CSA International
    1. CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
  2. Department of Justice Canada (Jus)
    1. Canadian Environmental Assessment Act (CEAA), 1995.
    2. Canadian Environmental Protection Act (CEPA), 1999:
      1. SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
      2. SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
      3. Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
  3. Underwriters' Laboratories of Canada (ULC)
    1. CAN/ULC-S660-08, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids.
    2. ULC/ORD-C58.15-1996, Overfill Protection Devices for Flammable Liquid Storage Tanks.
    3. ULC/ORD-C58.19-1996, Spill Containment Devices for Underground Tanks.
  4. U.S. Environmental Protection Agency (EPA)
    1. EPA CFR 86.098-10, Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.
    2. EPA CFR 86.098-11, Emission standards for 1998 and later model year diesel heavy-duty engines and vehicles.

3. EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### 1.3 SCOPE OF WORK

1. Execute all demolition work as specified on the plans.
2. Prepare a file on site conditions prior to the beginning of the work.
3. Eliminate restrictions, interferences and obstructions regarding access to the site.
4. Provide and install waste chutes, screens, barricades and safety scaffolds on site to protect workers and Ministry personnel and users.
5. Provide and install all of the necessary temporary protections to avoid damaging the equipment, buildings and/or existing services.
6. Right side: The General Contractor will be responsible for the verification of the masonry wall's overall stability during the entire duration of construction. The Contractor will also be responsible for the masonry wall's strength when its thickness will be reduced during construction in order to ensure that it will withstand soil thrust. The plans show the work in sequence in order to ensure that the wall will not topple. However, the instructions on the plans are only one stabilization option out of many. The Contractor will be solely responsible for the selection of a working method that will ensure a stability factor which will keep the wall from toppling during construction. The Contractor will provide a working method signed and stamped by an engineer certified by the "Ordre des Ingénieurs du Québec", which will demonstrate the safety of the method. Upon request of the Departmental Representative, the Contractor will provide the stabilization method's calculation notes.
7. Left side: The plans show a stabilization method using soil anchors installed in sequence. This is the stabilization method selected and equivalent methods or alternatives will be not accepted at the construction site. The anchors will ensure the stability of the wall during construction providing that the work sequence indicated on the plans is followed. The Departmental Representative will not commit to accepting an equivalent method or alternative proposed by the Contractor.

### 1.4 ADMINISTRATIVE REQUIREMENTS

1. Pre-Installation Meetings:
  1. Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative to:
    1. Verify project requirements.
    2. Verify existing site conditions adjacent to demolition work.
    3. Co-ordination with other construction subtrades.
  2. Ensure key personnel site supervisor, project manager and subcontractor representatives attend.
2. Scheduling:
  1. Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
    1. In event of unforeseen delay notify Departmental Representative.

## **1.5 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION**

1. Submit the documents and samples required as specified in section 01 33 00 - *Submittal Procedures* and in section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
2. The Contractor will see that all of the requirements related to document, sample and report submittals are met.
3. Shop drawings
  1. Submit, for review and approval, shop drawings, diagrams or details indicating the sequence of the demolition, shoring and underpinning work, as well as the elements used to complete the task.
4. Submitted demolition shop drawings must display the seal and signature of a competent engineer certified to work in Canada, in the province of Quebec, as specified in section 01 33 00 - *Submittal Procedure*.
5. Upon request from the engineer, submit a certificate confirming that the drawings have been approved by relevant authorities.

## **1.6 QUALITY ASSURANCE**

1. Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial and Municipal regulations.

## **1.7 IMPLEMENTATION CONDITIONS**

1. Environmental protection:
  1. Ensure Work is done in accordance with Section 01 35 43 - *Environmental Procedures*.
  2. Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
  3. Fires and burning of waste or materials is not permitted on site.
  4. Do not bury rubbish waste materials.
  5. Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
    1. Ensure proper disposal procedures are maintained throughout project.
  6. Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
  7. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction as directed by Departmental Representative.
  8. Protect trees, plants and foliage on site and adjacent properties where indicated.
  9. Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
  10. Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

## **1.8 EXISTING CONDITIONS**

1. If material resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Proceed only after receipt of written instructions have been received from Departmental Representative.

2. Structures to be demolished are based on their condition on date that tender is accepted, at time of examination prior to tendering.
  1. Remove, protect and store salvaged items as directed by Departmental Representative. Salvage items as identified by Departmental Representative. Deliver to Departmental Representative as directed.
3. As several masonry restoration efforts have been carried out on the project's structure over the years, it is possible that some stones were joined using products as hard as concrete. In addition, grout has already been injected into the walls and this could cause additional difficulties during disassembly activities. The Contractor will take the information above into consideration in his price schedule. No additional amount of money will be paid during construction for disassembly issues related to the hardness of the existing grout.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT**

1. Equipment and heavy machinery:
  1. On-road vehicles to: CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations and CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
2. Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

## **PART 3 - EXECUTION**

### **3.1 INSPECTIONS**

1. Inspect the structure with the Departmental Representative and verify the location and extent of the elements that must be removed, eliminated, emphasized, recycled, recovered and remain in place.
2. Identify and protect public utilities pipes and ensure that those remaining on site remain in good condition.
3. Notify the public utilities and obtain the necessary approval from them before beginning demolition work.
4. Disconnect, block, support or divert, as needed, the existing public utilities pipes located on site and that are hindering the execution of the work, as required by competent authorities. Identify the location of those pipes and those which had been left behind on site and mark them on the drawings (vertical and horizontal planes) after completion of the work. Support, brace and immobilize the identified pipes and conduits.
  1. Immediately inform the Departmental Representative, as well as the public utilities company involved, of any damage to a service conduit that must be saved.
  2. Immediately inform the Departmental Representative of the discovery of any unidentified public utilities service conduit and wait for written instructions regarding the action to be taken.
5. Unless otherwise indicated, remove demolished material from the site, while complying with the requirements of competent authorities in this matter, including the requirements applicable to environment protection.
6. Carefully remove all products and materials that must be re-installed in the context of this project or given to the Owner. Store them in a well-protected area. Leave them ready for installation by other trades or take them over to the location that has been specified by the Owner.

## 3.2 PREPARATION

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 demolition.
  3. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
2. Protection of in-place conditions:
  1. Work in accordance with Section 01 35 43 - *Environmental Procedures* and Erosion and Sedimentation Control Plan and Stormwater Pollution Prevention Plan.
  2. Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades properties parts of existing building to remain.
    1. Provide bracing, shoring and underpinning as required.
    2. Repair damage caused by demolition as directed by Departmental Representative.
  3. Support affected structures and, if safety of structure being demolished appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
  4. Support affected structures and, if safety of structure being appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
  5. Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.
  6. Assume responsibility for the damages incurred during work due to weather, negligence, lack of coordination or precautions, both inside and outside the building.
  7. Protect the surfaces to be saved from any possible damage and make all of the necessary repairs or replacements to the satisfaction of the Departmental Representative without additional costs.
  8. Coordinate demolition and removal of debris with the Departmental Representative in such as was as to avoid blocking elevators and electrical and mechanical systems that must remain operational.
  9. Execute demolition work using tools and equipment that allows demolition without risk of fire, collapse or other adverse effect on the property.
3. Surface Preparation:
  1. Disconnect and re-route electrical and telephone service lines entering buildings to be demolished, considering the point « 3 » below.
    1. Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.
  2. Disconnect and cap designated mechanical services
  3. Do not disrupt active or energized utilities traversing premises designated to remain undisturbed.

## 3.3 DEMOLITION

1. Do demolition work in accordance with Section 01 56 00 - *Temporary Barriers and Enclosures* - and with the requirements of the CSA-S350 standard.
2. Upon request of the Departmental Representative, provide the demolition methods and procedures in writing and for comment. Do not begin demolition or dismantling structural elements before having received the comments of the Departmental Representative.

3. Blasting operations not permitted during demolition.
4. Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
5. Prior to start of Work remove contaminated or hazardous materials listed as directed by Departmental Representative from site and dispose of at designated disposal facilities in safe manner and in accordance with TDGA and other applicable requirements and Section 02 81 01 - *Hazardous Materials*. Refer Existing Conditions in PART 1.
6. Demolish structures or parts of structure.
7. To permit construction of addition and as indicated.
8. Crush concrete generated due to demolition to size suitable for recycling as directed.
  1. Where possible identify markets which will accept crushed material as aggregate.
9. Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses with the approbation of the Departmental Representative.
10. At end of each day's work, leave Work in safe and stable condition.
  1. Protect interiors of parts not to be demolished from exterior elements at all times.
11. Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.
12. Demolish the concrete masonry walls in small pieces. Remove and carefully bring frame elements or other heavy or large objects down to the ground.
13. Contain fibrous materials to minimize release of airborne fibres while being transported within facility.
14. Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction. Selling or burning demolition materials on site is prohibited.
15. Execute the demolition work within the time periods specified in section 01 14 00 - *Work Restriction*.
  1. At the end of each work day, turn off all light sources with the exception of those used for safety purposes.
16. Removal of hard siding, curbs and gutters:
  1. Cut adjacent surfaces unaffected by the work at right angles, using a saw or any other means approved by the Departmental Representative.
  2. Protect the load transfer devices, as well as adjacent joints.
  3. Protect the underlying material or material adjacent to the work area.
17. Recut the framing headers of the partially demolished elements of the building in accordance with the tolerances specified in these contractual documents and by the Departmental Representative in order to facilitate the installation of the new elements.
18. Demolition work includes that which is required on the drawings and any other work required to complete the work or modifications. The demolition of a construction element involves the obligation to repair finishes or other adjacent construction elements.

19. Coordinate the execution of the work in such a way as to restrict to a minimum the disturbance and degradation of finishes or adjacent structures.
20. Include in this work any demolition work required for the execution of this project but not specifically included in the drawings: slab drilling to embed hardware or for the passage of mechanical or electrical infrastructures, etc.
21. The Contractor must include the demolition of any existing element or infrastructure rendered obsolete, specifically those left in service spaces, ceiling spaces, etc.

### 3.4 CLEANING

1. Develop Construction Waste Management related to Work of this Section.
2. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
  1. Remove recycling containers and bins from site and dispose of materials at appropriate facility.
3. Divert excess materials from landfill to site approved by Departmental Representative.
4. Designate appropriate security resources / measures to prevent vandalism, damage and theft.
5. Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.
6. If they are hindering the progression of the work, materials must be removed as specified in section 01 74 21 - *Construction/Demolition Waste Management and Disposal* and as directed by the Departmental Representative.
7. Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
8. Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
  1. Disposal facilities must be those approved of and listed in Waste Reduction Workplan.
  2. Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.
9. Refer to the specifications and demolition drawings to identify which materials are to be recovered for re-utilization/re-use.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 32 16.07 - Construction progress schedule - bar (GANTT).
2. Section 01 33 00 - Submittal procedures.
3. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **1.2 REFERENCES**

1. Canadian Standards Association (CSA)/CSA International
  1. CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  2. CSA-O86S1-F05, Supplement No. 1 to CAN/CSA-O86-D09, Engineering Design in Wood.
  3. CSA O121-08(R2013), Douglas Fir Plywood.
  4. CSA O151-09, Canadian Softwood Plywood.
  5. CSA O153-13, Poplar Plywood.
  6. CAN/CSA-O325-07(R2013), Construction Sheathing.
  7. CSA O437 Series-F93 (C2011), Standards for OSB and Waferboard.
  8. CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  9. CAN/CSA-S269.3-FM92 (C2013), Concrete Formwork, National Standard of Canada.
2. Underwriters' Laboratories of Canada (ULC)
  1. CAN/ULC-S701-11 Norme sur l'isolant thermique en polystyrène, panneaux et revêtements de tuyauterie.

### **1.3 SCOPE OF WORK**

1. Provide labour, equipment and material to build and install the formwork as specified on all plans and required for the complete and correct execution of the work.
2. Provide and install the blade seals, if applicable.
3. Make the construction, control and expansion joints as specified in the plans and specifications.
4. Install all of the anchors, plates, supports, bolts and accessories that must be incorporated into the concrete works or required by other disciplines.
5. Remove all of the formworks and waste generated in the course of the work.
6. Make all of the openings in the formworks required by other disciplines.
7. Caulk all of the construction, control and expansion joints.
8. Implement and verify all of the levels and dimensions of the structures covered by this section.



9. Provide and install the temporary shoring and braces, when required.
10. Fill the cones of the tie-beams.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

1. Submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
2. Submit shop drawings for formwork and falsework.
  1. Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  2. Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - *Sustainable Requirements: Construction*.
  3. Upon request, provide the Departmental Representative with one copy of a certificate of conformity signed and sealed by an engineer certified with the "Ordre des Ingénieurs du Québec" confirming that the formwork and shoring are compliant with the drawings described in Items 2 and 5 of this section.
  4. Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings Comply with CAN/CSA A23.1 and CAN/CSA-S269.3 for formwork drawings.
  5. Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
  6. Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative in accordance with the work sequence in section 01 32 16.07 - *Construction Progress Schedule - Bar (Gantt) Chart*.
  7. When slip forming and flying forms are used, submit details of equipment and procedures for review by Departmental Representative. These forms may or may not be accepted by the Ministry Representative after evaluation of the working methods and the proposed mechanical equipment.

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

1. Waste management and disposal:
  1. Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
  2. Place materials defined as hazardous or toxic in designated containers.
  3. Divert wood materials from landfill to a recycling reuse composting facility as approved by Departmental Representative.
  4. Divert plastic materials from landfill to a recycling reuse composting facility as approved by Departmental Representative.
  5. Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Formwork materials
  1. For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86 and CAN/CSA A23.1.
  2. For concrete with special architectural features, use new high-density overlay plywood, compliant with the O121 standard.
  3. Rigid insulation board: to CAN/ULC-S701.
  4. Material for temporary structures: Compliant with the ACNOR S269.1 standard, Table 1. The materials must have a quality index or come with certificates, testing reports or other confirmations of conformity.
2. Form ties :
  1. For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface and fitted with polyethylene cones for apparent surfaces. After the removal of the formwork, no part of the tie-beams must appear less than 16 mm from the surface.
  2. For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
3. Filling of the tie-beam cones: Quick setting, two-component cement based mortar modified with polymers, cement gray in colour. Compressive strength 20 MPa minimum after 24 hours and 50 MPa after 28 days.
4. Form oil: Chemical in nature, consisting of components that react with the free lime in the concrete to form water-insoluble soaps and that keep concrete from sticking to the forms, such as Grace's Releaser, ChemRex's Cast-Off or Euclid's Formshield Pure.
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. The formwork contractor must take into account that tolerance regarding excavation bottoms is 100 mm and that additional formwork is not admissible for this value.
2. Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
3. Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete and obtain the approval of the Departmental Representative.
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.
  1. Keep form joints to minimum.
9. Unless otherwise indicated, use 30 mm bevel strips for any visible edges and all edges in contact with a waterproof liner or membrane.
10. Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
11. Construct forms for architectural concrete, and place ties as indicated.
  1. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
12. Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  1. Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
13. If the formwork and temporary structures must be used again, comply with the CAN3-A23.1 standard, Article 11.
14. Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

### 3.2 REMOVAL OF FORMWORKS AND RESHORING

1. Once the concrete is poured, in weather conditions near 15 C, the Contractor may remove the forms after the following periods of time, providing that the curing method for free surfaces complies with the specifications and that they are satisfactory to the Departmental Representative:
  1. 12 hours for footings and abutments.
2. Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring. The curing method for the free surfaces must comply with the specifications and prove to be satisfactory to the Departmental Representative.
3. Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
4. Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

### 3.3 TOLERANCES

1. The following tolerances apply to exposed surfaces where alignment, level or plumb inaccuracies hinder the work of the other trades, reduce resistance under that which is specified or affect the functionality of the structure in any way:

The following variations are accepted:

#### Variations in vertical and horizontal lines and surface flatness

1. Walls, edges, slabs, columns and construction joints:
  1. Over a distance of 3 metres 6 mm
  2. Over a distance of 12 metres or more 20 mm
  3. Maximum offset *versus* the theoretical position 10 mm

2. For exposed corners, edges in contact with other materials, construction joints, grooves in formworks and other obvious lines:
  1. Over a distance of 3 metres 3 mm
  2. Over a distance of 12 metres or more 12 mm
  3. Maximum offset *versus* the theoretical position 6 mm
3. Acceptable offsets regarding the position 6 mm  
And elevation of the elements to be integrated into concrete other than anchor bolts
4. Acceptable offsets regarding the relative position 3 mm  
and elevation of the anchor bolts of a same column or group in compliance with Appendix D of the Code of Standard Practice for Structural Steel published by the Canadian Institute of Steel Construction
5. Acceptable offset regarding the dimensions 6 mm  
and location of openings
6. Acceptable offsets regarding the dimensions + 12 mm /  
of column cross-section and beams - 6 mm  
and the thickness of walls and slabs
7. Acceptable offset for the implementation 6 mm  
of reference axis for anchor bolts

### 3.4 INSPECTION OF THE FORMWORK PRIOR TO CONCRETING

1. Immediately prior to the pouring of concrete, inspect the formworks to make sure they are positioned correctly, adequately rigid, leak tight, clean, and that the walls have been adequately primed and free of snow, ice or other foreign substances.
2. Make temporary openings at the bottom of deep elements, such as columns and walls, to facilitate cleaning and inspection. Regarding elements where space is restricted, the openings must be located where water can be used to flush out debris and then sealed at the same level as the bottom of the wall.

### 3.5 PREPARATION OF THE FORMWORK PRIOR TO CONCRETING

1. Use form oil on all of the prepared form walls. Use form oil that will not stain or modify the colour of the exposed concrete surfaces. Use only the required quantity and remove the form oil where it came in contact with the reinforcement structure. If a coating is applied to the concrete surface, make sure it is compatible with the form oil. If necessary, use another product for form removal.
2. Wet all untreated formwork surfaces to avoid shrinkage and wet the surfaces again immediately prior to concreting.

### 3.6 LINES AND LEVELS

1. Mark all level and reference points.
2. During concreting, verify the lines, levels and alignment of the formworks.

### 3.7 CONSTRUCTION, CONTROL AND EXPANSION JOINTS

1. Not used.

### 3.8 ELEMENTS TO BE INTEGRATED INTO THE CONCRETE AND CNESST CERTIFICATE

1. Make openings and place the sleeves, fasteners, anchor bolts, stirrups and other elements to be incorporated into concrete floors and walls as specified by other trades. The sleeves, openings, etc., more than 100 mm X 100 mm not indicated on the structural drawings must be approved by the Departmental Representative.
2. Sleeves, pipes or other opening-type elements must not pass through a concrete wall or column unless formally indicated in the structural drawing details or authorized by the Departmental Representative.
3. Removing or moving reinforcements to install hardware is prohibited. If elements to be integrated into concrete cannot be placed at the specified location, have any modifications approved by the Departmental Representative.
4. Make sure all of the indications on the construction drawings regarding the location and size of sleeves, openings, etc., match those indicated on the drawings of other trade specialties.
5. Welding metal pieces to the steel reinforcement is prohibited, unless authorized by the Departmental Representative.
6. The Contractor must provide the "Commission des normes, de l'équité, de la santé et de la sécurité du travail du Québec" (CNESST) with all of the certificates required by the latter as per the "Code de sécurité pour les travaux de construction" (construction work safety code) of the "Loi sur la santé et la sécurité du travail" (law on health and safety in the workplace), including those requiring the signature of an engineer certified by the "Ordre des Ingénieurs du Québec" and related to the installation of anchor bars and posts on the plan of assembly (ref.: Articles 3.24.11 and 3.24.12 of the **"Modifications réglementaires au Code de sécurité pour les travaux de construction et Règlement sur la Santé et la sécurité du travail"**).

### 3.9 REINFORCING STEEL ON STAND BY

1. At some locations, reinforcement steel rods are indicated as standing by. The Contractor must take these details into account when preparing his bid. If required, he will have to perforate, notch or saw the formwork in order to respect the details shown.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 33 00 - Submittal Procedures.
2. Section 01 45 00 - Quality Control.
3. Section 01 74 11 - Cleaning.
4. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **1.2 REFERENCES**

1. American Concrete Institute (ACI)
  1. SP-66-04, ACI Detailing Manual 2004.
2. ASTM International
  1. ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  2. ASTM A 143/A 143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  3. ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  4. ASTM A 775/A 775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
3. CSA International
  1. CSA-A23.1-F09/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  2. CAN/CSA-A23.3-F04 (R2010), Design of Concrete Structures.
  3. CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
  4. CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  5. CAN/CSA-G164-FM92 (C2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  6. CSA W186-FM1990 (C2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
4. Institut d'acier d'armature du Canada (RSIC/IAAC)
  1. RSIC-2004, Reinforcing Steel Manual of Standard Practice.

### **1.3 SCOPE OF WORK**

1. Provide all material, equipment and labour required to build and install the steel framework required on all of the plans and/or required for the complete and correct execution of the structure.
2. Provide and install all rod chairs, anchor bars and spacers in reinforced concrete inverts, walls, slabs and beams required to support the reinforcing steel.
3. Provide and install the cement bricks required to support the reinforcing steel and/or metal mesh in the slab on ground, footings and inverts.

4. Protect the extremities of the reinforcement bars exposed by the cutting or drilling of concrete buttresses in order to install new drains. Refer to the specifications' section on materials to select the appropriate protection product.

#### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

1. Submit shop drawings in accordance with Section 01 33 00 - *Submittal Procedures*.
2. Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
3. Shop Drawings :
  1. Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec of Canada.
    1. Indicate placing of reinforcement and:
      1. Bar bending details.
      2. Lists.
      3. Quantities of reinforcement.
      4. Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
      5. Indicate sizes, spacings and locations of chairs, spacers and hangers.
      6. The details related to the installation of reinforcement, when required for special conditions.
4. Unless otherwise indicated, overlapping lengths, extension lengths of bars beyond critical points and rod overlapping lengths must comply with the CAN/CSA-A23.3 standard.
5. Generally speaking, all of the reinforcing steel must be bent so that it is parallel to the face of the concrete structures, as specified in the plans. The shaping must be done at the plant, in compliance with the shop drawings.
6. The corrections or comments on the shop drawings during their review do not relieve the General Contractor from his obligation to comply with the requirements of the plans and specifications. The verification only aims to control the general conformity of design and of the application of the information specified in the contract. The General Contractor is responsible for the confirmation and correlation of all degrees of quality and sizes, for choosing the building processes and techniques and for the safe execution of his work.
7. When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

#### 1.5 QUALITY ASSURANCE

1. Submit in accordance with Section 01 45 00 - *Quality Control* and as described in PART 2 - SOURCE QUALITY CONTROL.
  1. Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 2 weeks prior to beginning reinforcing work.
  2. Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

## **1.6 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, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area to avoid rust formation.
  2. Protect the reinforcing steel if it must remain unused for long periods of time.
  3. Remove all important traces of rust from the steel before its installation, subject to the approval of the Engineer.
  4. Replace defective or damaged materials with new.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Substitute different size bars only if permitted in writing by Departmental Representative.
2. Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
3. Reinforcing steel to be welded to steel elements incorporated in concrete: weldable low alloy steel deformed bars to CSA-G30.18, nuance 400W.
4. Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M and G30.3.
5. Deformed steel wire for concrete reinforcement: to ASTM A 82/A 82M and G30.3.
6. Epoxy Coating of non-prestressed reinforcement: to ASTM A 775/A 775M.
7. If required, Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m<sup>2</sup>.
  1. Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
  2. If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
    1. Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
  3. If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
    1. In this case, no restriction applies to temperature of solution.
  4. Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
    1. Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
8. Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2 and related supplements, with sufficient strength and appropriate for the frame used. The General Contractor must use vinyl covered chairs.
9. Mechanical splices: subject to approval of Departmental Representative.



10. Plain round bars: to CSA-G40.20/G40.21.
11. Apply a corrosion protection coating on the ends of reinforcement bars cut in the process of cutting buttresses and footings: Armatec 110, from Sika or MAPEFER 1K, from Mapei.

## **2.2 FABRICATION**

1. Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
2. Unless otherwise indicated in the plan, hooks must be standard and sizes must comply with the Reinforcing Steel Institute of Canada's manual of standards.
3. Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
4. Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
5. Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
  1. Ship epoxy coated bars in accordance with ASTM A 775A/A 775M.

## **2.3 SOURCE QUALITY CONTROL**

1. Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 2 weeks prior to beginning reinforcing work.
2. Upon request inform Departmental Representative of proposed source of material to be supplied.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

1. If galvanised reinforcing steel is used, galvanizing is to include chromate treatment.
  1. Duration of treatment to be 1 hour per 25 mm of bar diameter.
2. If applicable, conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

### **3.2 FIELD BENDING**

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

### **3.3 PLACING REINFORCEMENT**

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

2. Use plain round bars as slip dowels in concrete.
  1. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
  2. When paint is dry, apply thick even film of mineral lubricating grease.
3. Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
4. Ensure cover to reinforcement is maintained during concrete pour.
5. Protect epoxy coated portions of bars with covering during transportation and handling.
6. Make mechanical splices where indicated on the shop drawings.
7. Clean the reinforcing elements prior to concreting.
8. In slabs on ground, footings and inverts, reinforcements and/or meshes will be installed on chairs, supports and/or cement bricks. The technique consisting in lifting the reinforcement and/or mesh with a hook when pouring the concrete is prohibited, as is the use of stones or wood pieces. Regarding structural slabs, the reinforcement of the lower bed must be installed on continuous supports. Steel wire supports for the reinforcement of the higher layers are prohibited. Use plastic supports.
9. The technique consisting in moving a structural rod under a reinforcement bed in order to use it as an anchoring bar or support bar is prohibited. If bars are to be used for anchoring or support, they must be additional bars.
10. **Welding the reinforcement bars shown on the plans is prohibited**, unless otherwise specified. If welding is required, weldable steel compliant with the G30.18 nuance 400 W standard is required.
11. Wall and column bars must be installed using formworks or templates prior to concreting.

### 3.4 FIELD TOUCH-UP

1. Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

### 3.5 CLEANING

1. Progress Cleaning: clean in accordance with Section 01 74 11 - *Cleaning*.
  1. Leave Work area clean at end of each day.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - *Cleaning*.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### 3.6 INCORPORATION OF REINFORCEMENT IN CONCRETE (TYPICAL, UNLESS OTHERWISE INDICATED ON THE PLANS)

1. Incorporation in concrete must be measured from the surface of the concrete to the crenulation closest to the reinforcement or up to the surface of smooth bars or wires, as the case may be.
2. The reinforcement includes bar filaments (or ligatures), stirrups and the main steel.

3. Regarding textured architectural surfaces, incorporation in concrete must be measured from the deepest point of the textured surface.
4. The minimum net depths (in mm) of the reinforcement bars in concrete is as follows, unless otherwise indicated:

SURFACE CONDITONS	EXPOSURE CLASSIFICATION		
	Unexposed <sup>(1)</sup>	Exposed to freeze-thaw cycle	Exposed to chlorides
Concrete against the ground and in permanent contact with the latter	75	75	
Strip footing	40	40	

**Note:**

- <sup>(1)</sup> Unexposed concrete only applies to concrete that will continually be maintained as dry in a conditioned space, i.e. all of the elements will be inside the vapor barrier around the building.

### 3.7 SUPERVISION

1. For the entire duration of concreting, the General Contractor will assign a worker to the construction site, who will re-position the reinforcement steel bars and/or metal mesh that may move during the pouring.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT).
2. Section 01 33 00 - Submittal Procedures.
3. Section 01 45 00 - Quality Control.
4. Section 01 74 11 - Cleaning.
5. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **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. Type MS and MSb - Moderate sulphate-resistant cement.
    3. Type MH, MHb and MHL - Moderate heat of hydration cement.
    4. Type HE, HEb and HEL - High early-strength cement.
    5. Type LH, LHb and LHL - Low heat of hydration cement.
    6. Type HS and HSb - High sulphate-resistant cement.
  2. Fly ash :
    1. Type F - with CaO content less than 15%.
    2. Type CI - with CaO content ranging from 15 to 20%.
    3. Type CH - with CaO greater than 20%.
  3. GGBFS - Ground, granulated blast-furnace slag.
2. Reference Standards :
  1. ASTM International
    1. ASTM C171-07, Standard Specification for Sheet Materials for Curing Concrete.
    2. ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
    3. ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    4. ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.
    5. ASTM C1017/C1017M-013, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
    6. ASTM C882/C882M-13a, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
    7. ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

8. ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
9. ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
10. ASTM D1752-04a (2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
2. Canadian General Standards Board (CGSB)
  1. CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
  2. CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
3. CSA International
  1. CSA A23.1/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  2. CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.
  3. CSA A3000-F08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005.
  4. CSA-A5 / A8 / A362-98, Portland Cements / Masonry cements / Cement compounds.

### 1.3 SCOPE OF WORK

1. Provide and cast concrete in place. Provide the equipment and labour required to complete the concreting work indicated on all plans.
2. Finish the concrete surfaces.
3. Repair the defective concrete surfaces.
4. Heat and cure the concrete.

### 1.4 ADMINISTRATIVE REQUIREMENTS

1. Pre-installation Meetings: in accordance with Section 01 32 16.06 - *Construction Progress Schedule - Critical Path Method (CPM)* Section 01 32 16.07 - *Construction Progress Schedules - Bar (GANTT) Chart*, convene pre-installation meeting one week prior to beginning concrete works).
  1. Ensure key personnel, site supervisor, Departmental Representative speciality contractor - finishing, forming concrete producer attend.
    1. Verify project requirements.

### 1.5 ACTION AND INFORMATIONAL SUBMITTALS

1. Provide submittals in accordance with Section 01 33 00 - *Submittal Procedures*.
2. Provide testing results reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
3. Submit two (2) copies of the most recent technical data sheets for the specified products. These sheets must show the physical properties of the material and include details on the installation method, restrictions, constraints and other manufacturer recommendations.

4. Provide a document produced by the manufacturer certifying that the latter officially recognizes the contractor in charge of the execution of the work as an authorized contractor.
5. Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
6. Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time specified in section 2.5 of Part 2 for concrete to be delivered to site of Work and discharged after batching.

## 1.6 QUALITY ASSURANCE

1. Quality Assurance: in accordance with Section 01 45 00 - *Quality Control*.
2. Provide Departmental Representative, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  1. Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
3. Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items :
  1. Falsework erection.
  2. Hot weather concrete.
  3. Cold weather concrete.
  4. Curing.
  5. Finishes.
  6. Formwork removal.
  7. Joints.
4. Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

## 1.7 DELIVERY, STORAGE AND HANDLING

1. Delivery and Acceptance Requirements :
  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 Departmental Representative laboratory representative and concrete producer as described in CSA A23.1/A23.2.
    2. Deviations to be submitted for review by Departmental Representative.
  2. Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
2. Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials in accordance with Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

1. Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

### **2.2 PERFORMANCE CRITERIA**

1. Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

### **2.3 MATERIALS**

1. Cement: for general use, to CSA A-A5/A8/A362.
2. Water: to CSA A23.1.
3. Aggregates: to CSA A23.1/A23.2.
4. Admixtures :
  1. Air entraining admixture: to ASTM C260.
  2. Chemical admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
5. Concrete adhesive: three-component (3) anticorrosion coating and binding agent, cement and modified water-based epoxy:
  1. Bonding strength/concrete (CAN/CSA A23.2-6B): 2-3 MPa.
  2. Bonding strength/steel (CAN/CSA A23.2-6B): 1-2 MPa.
  3. Bonding strength at 14 days (ASTM C882) fresh on fresh: 20.7 MPa.
  4. Bonding strength at 14 days (ASTM C882) curing time in the open 12 hours: 13.8 MPa.
6. Acceptable materials or products: When materials or products are specified by brand, consult the instructions to the bidders regarding the procedure for the approval of replacement materials or products.

### **2.4 MIXES**

1. Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
  1. Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
2. Prepare normal density concrete as specified in standard A23.1 in order to obtain the required mix for all of the types of concrete specified in the plans and specifications and in accordance with the exposure types.
3. Concrete type: Unless otherwise indicated in the drawings, anticipate the use of the following types of concrete:
  1. Outdoor constructions, sidewalks, curbs, concrete slabs between rails ..... E-0
  2. Foundations (strip footings, projections, etc.), unless otherwise indicated, and concrete coping ..... N-1

Concrete Type	Usual Application and Degree of Exposure Considered <sup>(1)</sup>	Strength at 28 Days (MPa) <sup>(7)</sup>	Chloride Ion Permeability <sup>(6)</sup>	Entrained Air <sup>(8)</sup>	Aggregates Maximum <sup>(2)</sup> (mm)	Maximum Water/Cement Ratio
N-1	General use Unexposed	30 (26 max at 7 days)	---	4 to 7%	20	<sup>(3)</sup>
E-0	General use Exposed	35 (30 max at 7 days)	---	5 to 8%	20 <sup>(5)</sup>	0,45
M-1	Lean concrete <sup>(4)</sup> Unexposed	10	---	4 to 7%	20	<sup>(3)</sup>

**Notes:**

- (1) Concrete exposure: To freeze-thaw cycles and/or de-icing salts (chlorides). For exposure classes, see A23.1, Table 1.
- (2) Aggregates: Provide a certificate compliant with A23.2 confirming that the aggregates are not subject to alkali-aggregate reactions. Anticipate the use of aggregates 10 mm maximum for concreting in thin spaces. Adjust the parameters of the mix, if necessary, to preserve the characteristics of the hardened concrete. For the exposed slab-on-grade, provide aggregates identical in colour and size to the existing material.
- (3) Maximum water/cement ratio: Must be determined based on the dosage required and the specifications.
- (4) Lean concrete: If pumpability is desired, enrich the water/cement ratio as required.
- (5) Sidewalks and curbs: Anticipate the use of granite aggregates.
- (6) Chloride ion permeability: Conduct pre-qualification tests compliant with A23.2.
- (7) Strength at 7 days: See Article 2.2.4 for prior tests.
- (8) Entrained air: Air content required at the pouring locations in the forms (i.e. at the concrete pump outlet).
4. In order to validate the proposed mix, two weeks at the latest before the beginning of the work, provide the Departmental Representative with a document produced by an independent laboratory recognized by the Departmental Representative, confirming that the mixes proposed by the General Contractor will produce concrete that will meet the requirements of the specifications and of the A23.1 standard. These mixes must have been tested at 7 days in the last six months. The average strength of six (6) samples per mix must fall within the following percentages of strength at 28 days:
    1. Cements Gu et Gu<sub>b</sub> – SF = 75% ± 10%.
    2. Cements Gu<sub>b</sub> – S/SF, Gu<sub>b</sub> – F/SF and ternary = 70% ± 10%.
  5. If required and following the tests and control results for the concrete at the site, the mixes must be corrected at the satisfaction of the Departmental Representative and meet the specifications.
  6. Upon request, provide a document confirming that the mixing facility and the materials used to manufacture the concrete are compliant with the requirements of the CSA-A23.1 standard.
  7. Obtain the approval of the Departmental Representative before using chemicals other than those specified.
  8. The use of calcium chloride is prohibited at all times.



9. Base slump for all of the mixes is 80 mm  $\pm$ 30 (except for M-1 concrete: 100 mm  $\pm$ 30). The slump may be modified by the General Contractor based on the required workability of the concrete and its placement. When superplasticizer is added to facilitate placement, the maximum slump is limited to 175 mm.
10. Adjust the mixes if variations occur at the concrete producer level.

## **2.5 CONCRETE PROCUREMENT**

1. The truck number and the characteristics of the concrete mix must appear on the bills of lading accompanying the delivery of premixed concrete.
2. Unless instructed in writing by the Departmental Representative, adding water to the water already in the concrete mix, whether during transportation or after its delivery on site, is prohibited.
3. The concrete must be unloaded less than 2 hours after water and cement come into contact. After that period of time, the concrete will be refused. If the ambient temperature is 27 °C or more, the unloading delay is shortened to 90 minutes.

## **2.6 SURFACE FINISH**

1. The concrete coping will have a brushed finish. Steel trowels will not be used.

## **2.7 FINISHING PRODUCTS FOR CONCRETE SLABS**

1. Not used.

# **PART 3 - EXECUTION**

## **3.1 PREPARATION**

1. Obtain Departmental Representative's written approval before placing concrete.
  1. Provide 24 hours minimum notice prior to placing of concrete and specify the area of work involved and the estimated time of concrete placement.
2. Place concrete reinforcing in accordance with Section 03 20 00 - *Concrete Reinforcing*.
3. During concreting operations :
  1. Development of cold joints not allowed.
  2. Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
4. Ensure reinforcement and inserts are not disturbed during concrete placement.
5. Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
6. Protect previous Work from staining.
7. Clean and remove stains prior to application for concrete finishes.
8. Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

9. Do not place load upon new concrete until authorized by Departmental Representative or in accordance with Section 03 10 00 - *Concrete Forming and Accessories*.
10. Transport the concrete from the truck to its destination using means that will keep the concrete components from separating or from significantly altering its consistency.
11. The concrete dropping height must never exceed 1.5 m. The use of sliders and chutes placed to avoid concrete segregation must be used.
12. Concrete is compacted using vibrators plunged into its mass. Vibrators must be inserted fairly close together to obtain complete compactness. Excessive vibration that could cause the separation of the concrete's components must be avoided. Do not force the concrete into place horizontally with the vibrators.
13. An adequate number of vibrators must be kept on site. Emergency vibrators must be available at all times, in case the regular vibrators fail.
14. Prior to concrete placing, formworks must be cleaned and the water drained from them.
15. Concrete must not be placed in water without special permission and then, only strictly as specified and instructed by the Departmental Representative
16. Concrete curing and protection: As specified in the A23.1 standard and these specifications. The latter will prevail on the standard.
17. Prior to placing fresh concrete against hardened concrete, apply a concrete adhesive to the latter.

### 3.2 INSTALLATION/APPLICATION

1. Do cast-in-place concrete work to CSA A23.1/A23.2.
2. Sleeves and inserts :
  1. Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  2. Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
  3. Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
  4. Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative.
  5. Confirm locations and sizes of sleeves and openings shown on drawings.
  6. Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
3. Anchor bolts :
  1. Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
4. Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

### 3.3 SURFACE TOLERANCE

1. Concrete tolerance to CSA A23.1.

### 3.4 FIELD QUALITY CONTROL

1. An independent laboratory retained and paid for by the Departmental Representative will take samples and conduct tests at regular intervals in order to determine if the concrete in place meets the specified quality requirements.
2. Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
  1. Ensure that the testing laboratory is certified according to standard CSA A283.
3. The General Contractor must cooperate fully with this testing by granting access to the site and equipment, by supplying the labour and material necessary for the preparation of the tubes, and by storing the samples to avoid issues or losses. The General Contractor will provide a closed space available exclusively for the storage of the samples.
4. Three (3) tubes will be filled with concrete from the day's placement. If the day's placement exceeds 100 m<sup>3</sup>, three (3) additional tubes per 50 m<sup>3</sup> will be filled with concrete.
5. The samples and tests must be processed as close as possible from the point of placement in the forms (e.g. at the outlet of the concrete pump, conveyor or bucket) in order to obtain accurate concrete properties.
6. The tubes will be stored and cured as laboratory specimens. One will be broken after 7 days and the other two after 28 days. Occasionally, the laboratory will fill a fourth tube, which will serve as a control specimen on site and will be broken at its request.
7. All of the testing methods (destructive or not) and storage and curing facilities must meet the requirements of the CSA-A23.1/A23.2 standard.
8. If the concrete is mixed at the plant, the air content and slump will be tested from each truck mixer. If the concrete is mixed at the construction site, control will take place every four (4) cubic meter of concrete or more frequently if required by the Departmental Representative.
9. For testing purposes, submit small and large aggregates to the Departmental Representative, as well as the mix formula, as specified in standard A23.2.

### 3.5 CURING

1. General
  1. Curing must begin immediately after placing and finishing and the temperature and humidity during the curing period must be suitable to ensure that the concrete will achieve proper strength, durability and other properties.
  2. All of the concrete surfaces must be cured (e.g. sides and top of walls).
  3. The material required to ensure the protection of the concrete and curing must be made available and be ready to be used prior to the beginning of concrete placement.
2. Curing types and duration
  1. Concrete must cure for a minimum duration of 7 consecutive days following placement. During that period, the temperature of the concrete must be higher than 10 °C. The duration of curing must be extended until the concrete achieves a degree of strength higher than 70 % of the specified strength.
3. Curing methods
  1. Concrete curing is achieved through one or several of the following methods:

1. Ponding or continuous watering.
  2. Water retaining material (canvas or other absorptive material kept wet (Ultracure curing blanket or equivalent)).
  3. Forms in contact with the concrete's surface.
  4. Other water retaining materials approved by the Departmental Representative.
4. Curing materials
  1. Materials used to cure concrete must meet the requirements of one of the following standards:
    1. ASTM C171 Sheet Materials for Curing Concrete.
    2. ASTM C309 Liquid Membrane – Forming Compounds for Curing Concrete.
  2. The water used for curing must not have damaging effects on concrete.
  3. Notes on curing products:
    1. Most liquid curing products are not suitable for concrete surfaces that will be bonded with a subsequent layer of concrete or with another surface covering. However, they are suitable if the products are to be removed completely after curing through sandblasting or a known solvent, or if tests clearly show that traces of the product will not reduce bond below specified values.
    2. The curing products must be applied to form a film sufficiently thick and continuous on the concrete's surface. The mix and application method must comply with the manufacturer's recommendations. This film must be protected to ensure it remains intact for the entire curing period.
5. Reduction of the curing period
  1. Reducing the curing period through means to obtain the specified concrete strength over a shorter period of time must be authorized by the Departmental Representative.
6. Curing during extreme temperatures
  1. Curing in hot weather
    1. When the ambient temperature reaches 27°C or higher, curing during the first three (3) days must be achieved through uninterrupted watering or the use of a water retaining material maintained constantly wet, in order to use cooling as a result of evaporation.
  2. Curing in cold weather

During freezing weather, curing with water must cease 12 hours before the end of the protection period.

### **3.6 CONCRETE PROTECTION**

1. General
  1. Freshly placed and finished concrete must be adequately protected against unfavorable conditions, such as high winds, precipitation, frost, abnormally high temperatures, temperature variations, premature drying and loss of moisture during the period of time required for the concrete to achieve the desired characteristics. In addition, work or other disturbances near the concrete that may affect new concrete negatively, such as soil compaction, pile driving, vibrations, etc., must be taken into consideration when selecting the protection measures.
  2. The General Contractor is responsible for the determination of the various criteria required to establish adequate protection methods based on site conditions. The data will be submitted to the Department Representative for verification and approval. In addition the measuring instruments will have to be made available, upon request from the Department Representative, for periodic validation.

2. Protection against evaporation

1. If the evaporation rate of superficial moisture is higher than  $0.50 \text{ kg/m}^2$ , additional action must be taken to prevent the quick drying of the concrete's surface. The General Contractor must implement at least two of the most appropriate measures listed below:
  1. Water the support prior to concrete placement.
  2. Build sun screens above the concrete during finishing.
  3. Lower the temperature of the concrete to bring the evaporation rate under  $0.50 \text{ kg/m}^2\text{hr}$ , while respecting the temperature restrictions applicable to the concrete at placement time.
  4. Cover the concrete surface with a white polyethylene sheet in between the various finishing operations.
  5. Spray water (fogging) on the concrete immediately after placement and before the finishing, taking care to avoid water accumulation that would alter the quality of the cement paste.
  6. Place and finish the concrete at night.

Note

The General Contractor must estimate the evaporation rate using Figure D1 in Appendix D of the A23.1 standard, based on relative humidity measurements, the temperature of the concrete and of the ambient air and on wind speed, to be submitted to the Departmental Representative for verification.

### 3.7 CONCRETING IN HOT WEATHER

1. Then ambient temperature is  $27^\circ\text{C}$  or higher or when it is likely that temperature will reach  $27^\circ\text{C}$  during concrete placement (based on the weather forecasts for the area), the General Contractor must take special care to protect the concrete from the effects of hot and dry weather.
2. Under the intense dry conditions defined in Item 3.4.2 (protection against evaporation), the forms, framework, fresh concrete and concreting materials must be protected against direct sunlight or cooled through fogging.
3. The temperature of the concrete during placement must be as low as possible and must not in any way exceed the temperatures listed in the table entitled "Temperature Range for Concrete Placement". When the temperature of the concrete remains higher than  $25^\circ\text{C}$  during placement, the General Contractor must consider using an additive to delay setting, at his own expense.

### 3.8 CONCRETING IN COLD WEATHER

1. General
  1. If temperature is  $5^\circ\text{C}$  or lower, or if there is a possibility that it will drop under  $5^\circ\text{C}$  in the 24 hours following concrete placement (based on the weather forecasts in the area), all of the material required to protect the concrete and curing must be available on site and ready to use prior to concrete placement.
  2. In addition, the concrete must be adequately protected during the entire curing period. During curing, the temperature of the concrete must be continually maintained above  $10^\circ\text{C}$  and the maximum temperature variation allowed between the concrete surface and the ambient temperature must not be exceeded.
  3. Protection must be ensured through heated shelters, blankets, insulation or a combination of all of the above.

2. Temperature range of concrete at placement time

1. At placement time, the temperature of the concrete mix must comply with the following table:

**TEMPERATURE RANGE FOR CONCRETE PLACEMENT**

ELEMENT THICKNESS	TEMPERATURE (°C)	
	Minimum	Maximum
Less than 0.3 m	10	35
Between 0.3 m to less than 1 m	10	30
Between 1 m and 2 m	5	25
In excess of 2 m	5	20

3. Preparations for concrete placement in cold weather

1. Prior to the placement of the concrete on the entire surface, snow and ice must be removed. Calcium chloride must not be used as a de-icing agent in the forms. Concrete must not be placed on a surface where the temperature is lower than 5°C or on a surface that could make the temperature of the concrete drop below the minimum range allowed in the table entitled "Temperature Range for Concrete Placement".

4. Protection methods

1. Heated shelters

1. The shelters must be built in such a way as to resist driving wind and snow and be reasonably air tight. There must be sufficient space between the concrete and the shelter to allow the circulation of heated air. The shelter must be heated with live steam, forced heated air or using fixed heating devices or others. At concrete placement time and during the curing period, the concrete surfaces must be protected against direct exposure to combustion gas or drying caused by heating devices, using forms or an impervious membrane.
2. Avoid combustion gases inside the heated shelters by using indirect-fired heaters as this could cause severe health problems and the concrete surface could be damaged by carbonation and others.

2. Protection blankets and insulation

1. The type of protection blanket and the quantity of insulation required to ensure proper curing in cold weather must be determined by the General Contractor based on the ACI306R standard ("Guide to cold weather concreting"), and on the ambient temperature and wind speed (chill factor), the size and shape of the concrete structure and on the bond strength of the concrete. Submit the calculations to the Departmental Representative for verification.

3. Minimum protection during curing

1. When the exterior temperature is 5°C or lower, appropriate blankets and sufficient insulation must be properly placed on the concrete elements.

5. Maximum temperature variation allowed

1. During the protection and curing period, the minimum variations between the temperature of the concrete surface and the ambient temperature must be respected in order to reduce cracking.
2. In addition, to avoid cracking at the end of the curing period due to abrupt changes in temperature, some protection must be maintained until the temperature variation between the concrete and the ambient air is equal or lower than the variations indicated in the following table.

**MAXIMUM TEMPERATURE VARIATION ALLOWED  
BETWEEN THE CONCRETE SURFACE AND AMBIENT AIR  
(WIND 25 KM/H AT MOST)**

Concrete Thickness (m)	Maximum Temperature Variation Allowed (°C) Length/Height Ratio of the Structure *				
	0**	3	5	7	20 or more
< 0.3	29	22	19	17	12
0.6	22	18	16	15	12
0.9	18	16	15	14	12
1.2	17	15	14	13	12
> 1.5	16	14	13	13	12

\* "Length" is the greatest restricted size and "Height" is the unrestricted size.

\*\* Very high and thin elements, such as poles.

### 3.9 TEMPERATURE RECORDS

1. It is the responsibility of the General Contractor to determine and record the ambient temperature and that of the concrete during the protection and curing period. The records must include the date, time and location of each temperature measurement. In cold weather, the temperature of the shelters and concrete surfaces must be monitored, among other activities. In hot weather, the ambient temperatures and those of the concrete surface must be recorded, as well as wind speeds and relative humidity. The temperatures must be recorded on the form attached to this section. Upon request, the temperature records must be sent to the Departmental Representative for verification.

### 3.10 NON-CONFORM CONCRETE

1. The Departmental Representative may require the demolition, replacement or repairs with regard to any concrete deemed non-conform to the specifications.
2. If the strength of placed concrete measured through sampling proves to be inadequate versus the specifications, the Departmental Representative may require financial compensation based on the provisions of the CCDG. The control laboratory will be responsible for the calculation of the penalty.

### 3.11 OPENINGS IN CONCRETE

1. Make openings in existing concrete as instructed by the Departmental Representative and only after having received his approval. Use a carborundum saw blade or diamond drill.

### 3.12 CONSTRUCTION JOINTS

1. Clean the surface of the construction joint before starting the second concreting phase to remove the bleeding produced as a result of over-vibrating the concrete and any foreign substance.
2. The surface of the concrete previously placed must have a roughness amplitude of at least 5 mm.
3. Follow the specific instructions of the Departmental Representative if required by the nature of the work.

### 3.13 SEALANT AND HARDENER

1. When requested, apply a hardener or sealant as recommended by the manufacturer.

### 3.14 SAW KERFS IN SLABS

1. Make saw kerfs in the coping at 5m c/c and at the junction of the left face and the right flank. Fill the construction joints with a one-part, low modulus hybrid sealant with a 50% movement capacity, 1000% elongation and secant tensile modulus of 5,4 N/mm. The joint will be 10 mm wide and 6 mm deep. Apply primer to the concrete prior to the application of the sealant and fill the joint with a high strength bead.

### 3.15 CLEANING

1. Clean in accordance with Section 01 74 11 - *Cleaning*.
2. Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
  1. Provide appropriate area on job site where concrete trucks and be safely washed.
  2. Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
  3. Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  4. Prevent admixtures and additive materials from entering drinking water supplies or streams.
  5. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
  6. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

### 3.16 ANNEX

1. Records
  1. Temperature records.



Project : \_\_\_\_\_  
BPR project number : \_\_\_\_\_  
Reading by : \_\_\_\_\_

### temperature records

Checked item, date and time	During the concrete pouring						During the concrete curing									
		A.T.. (°C)	R.H.. (%)	C.T.. (°C)	W.Speed (km/h)	evap.rate		A.T.. (°C)			C.T.. (°C)			R.H.. (%)		
	Day 1						Time	7h00	12h00	16h00	7h00	12h00	16h00	7h00	12h00	16h00
Day 1																
Day 2																
Day 3																
Day 4																
Day 5																
Day 6																
Day 7																
	Day 1						Time	7h00	12h00	16h00	7h00	12h00	16h00	7h00	12h00	16h00
Day 1																
Day 2																
Day 3																
Day 4																
Day 5																
Day 6																
Day 7																
	Day 1						Time	7h00	12h00	16h00	7h00	12h00	16h00	7h00	12h00	16h00
Day 1																
Day 2																
Day 3																
Day 4																
Day 5																
Day 6																
Day 7																
	Day 1						Time	7h00	12h00	16h00	7h00	12h00	16h00	7h00	12h00	16h00
Day 1																
Day 2																
Day 3																
Day 4																
Day 5																
Day 6																
Day 7																

\* the verified item must be clearly described and located

R.H. : Relative humidity  
C.T. : Concrete temperature  
W. Speed : Wind speed  
Evap. rate : Evaporation rate  
A.T. : Ambient temperature

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 04 03 07 – Historic – Masonry Repointing and Repair.
2. Section 04 03 42 – Historic – Replacement of stone.
3. Section 04 05 19 – Masonry Anchorage, Connection and Reinforcing.
4. Any other relevant specification.

### **1.2 REFERENCES**

1. Definitions
  1. Low pressure water soaking: less than 350 kPa (50 psi), measured at nozzle tip.
  2. Medium-pressure water soaking: minimum 350 kPa (50 psi) and maximum 2700 kPa (400 psi), measured at nozzle tip.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

1. Submit the required documents and samples in accordance with Section 01 33 00 *Submittal Procedures*.
2. Provide the material and safety data sheets as required by the Workplace Hazardous Materials Information System (WHMIS) and in accordance with section 01 33 00 *Submittal Procedures*.
3. Provide proposed cleaning method and type of protection from cleaning residue for in-place conditions.

### **1.4 QUALITY ASSURANCE**

1. Mock-ups:
  1. Do mock-up tests in accordance with Section 01 45 00 *Quality Control*.
  2. Notify Departmental Representative 48 hours before commencing cleaning of each test patch.
    1. Obtain approval from the Departmental Representative before commencing test.
  3. Conduct tests on wall to determine effectiveness of the cleaning methods.
  4. Start with lowest impact tests and stop testing when desired level of cleaning is achieved, stop testing immediately when damage is caused.
  5. Do not proceed with work without approval of mock-up.
  6. Allow 24 hours for inspection of mock-up by the Departmental Representative.
  7. Accepted mock-up will demonstrate minimum standard for work.

## **1.5 AMBIENT CONDITIONS**

1. Do not use wet cleaning methods when there is threat of frost.
2. Do not use chemical cleaners when temperature is below 10 degrees C.
3. Follow manufacturer's written instructions on use of chemical cleaners in accordance with product's temperature range application.
4. Provide shading to wall to avoid cleaning in full, hot sunlight.
5. Do not clean if there is risk of chemical spray being blown onto surrounding historic material, publicly accessible areas or plants.

## **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 air free from oil or other contaminants.

### **2.2 TOOLS AND EQUIPMENT**

1. Use brushes with natural or soft plastic bristles.
2. Use 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.
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 before and after cleaning. Notify the Departmental Representative of potential complications.
2. Report to the Departmental Representative the conditions of deteriorated masonry or pointing not noted on Contract Drawings found before and during cleaning.
3. Obtain written approval of the Departmental Representative 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 the required personal protection equipment.
2. Place safety devices and signs near work areas as indicated and directed.
3. Repair and seal openings and joints prior to cleaning where there is potential risk of water/chemical infiltration in the masonry.
4. Provide an enclosure around work area.
  1. Obtain approval of enclosure from the Departmental Representative before commencing cleaning procedure.

### 3.3 PROTECTION OF IN-PLACE CONDITIONS

1. Cover and protect surfaces and non-masonry finishes not to be cleaned.
  1. Obtain approval of protection method from the Departmental Representative before commencing cleaning procedure.
2. Protect wood, glass, and metal adjacent to masonry.
3. Protect plants, gardens, shrubs from watering and chemicals.
4. Hang tarpaulins from scaffolding to enclose water spray.
5. Protect cleaned surfaces to be painted from contact with rain and snow.
6. Protect rainwater leaders, eaves troughs and gutters from being blocked by residue.
7. Protect adjacent Work from spread of dust and dirt beyond work areas.

### 3.4 EXECUTION OF CLEANING

1. Proceed with cleaning in accordance with written instructions of methods, systems, tools and equipment approved by the Departmental Representative. **All masonry works will be cleaned (exterior face) prior to the disassembly of the walls. A second cleaning will be carried out at the end of construction.**
2. Dry brush or scrape accumulations from walls, ledges and cornices.
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 the Departmental Representative at tests.
5. Stop work when cleaning has detrimental effect on surrounding material and plants.
6. Avoid prolonged wetting and excessive water penetration.
7. Apply chemical cleaners approved by the Departmental Representative. Respect the penetration time recommended by the manufacturer.
8. Brush and scrape only to supplement water washing.

9. Undertake prolonged water spray to soften and loosen heavy deposits, then brush. Remove thick incrustations with wooden scrapers.
10. Apply chemical cleaners approved by the Departmental Representative to remove stains and dirt.
11. Apply poultices as approved by the Departmental Representative based on tests.
12. 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.
13. Low-Pressure Water Soaking:
  1. Remove accumulated dirt with low-pressure (maximum 350 kPa] [50 psi). Wash-down at flow rate of 0.25 L/s.
  2. Hold nozzle at least 450 mm from surface to be cleared.
  3. Follow soaking by gentle scrubbing with natural bristle brushes.
14. Medium-Pressure Water Cleaning:
  1. Remove accumulated dirt with medium-pressure (ranging between [350 and 2700 kPa] [50 and 400 psi] wash-down at flow rate of 0.25 L/s.
  2. Use a fan-type nozzle with minimum 375 mm spread.
  3. Hold nozzle minimum 450 mm from masonry surface.
15. Heated water cleaning:
  1. Use previously tested heated water approved by the Departmental Representative.
  2. Before steam cleaning:
    1. Use alkaline chemicals on carbonate stones to support steam cleaning.
      1. Apply slurry of alkaline cleaner to stone for maximum 15 minutes prior to steam cleaning.
      2. Rinse cleaner from stone before proceeding with steam cleaning.
16. Clean up work area as work progresses. At end of each work day remove debris and waste from site and carry out a general cleaning of the surfaces.
17. Upon completion, clean and restore areas used for work to condition equal to that previously existing.

### **3.5 PROTECTION OF WORK**

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

**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 19 – Masonry Anchorage, Connection and Reinforcing.
4. Any other relevant specification.

### **1.2 REFERENCES**

1. Definitions
  1. Raking: removal of loose/deteriorated mortar to a depth suitable for repointing until sound mortar, and/or 4x joint thickness and/or a specified mm depth mm is reached.
  2. Repointing: filling and finishing of masonry joints from which mortar is missing has been raked out or has been omitted.
  3. Restoration of detached elements: Restoration of an isolated masonry element of the siding, which was loosened during the raking.
  4. Tooling: finishing of masonry joints using tool to provide final contour or as instructed by the Departmental Representative.
  5. Low-pressure water cleaning: water soaking of masonry using less than 350 kPa (50 psi) water pressure, measured at nozzle tip of hose.
  6. Cleaning using a mechanical tool: removal of loose particles from masonry elements and joints (splinters, cuts, flakes, etc.) using a bush hammer or any other appropriate tool.
2. CSA International
  1. CAN/CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  2. AN/CSA A179-F04 (C2009), Mortar and Grout for Unit Masonry.
  3. CSA-A371, Building Masonry.

### **1.3 DESCRIPTION OF THE WORK**

1. The work required in this section includes the following, among others:
  1. The raking of indicated deteriorated joints.
  2. Masonry surface preparation, including the cleaning of the joint surfaces, the rinsing of voids and raked joints, as well as the dampening of the masonry.
  3. The repointing of masonry joints using tools adapted to the condition of the existing masonry, e.g. irregular stone profiles, variations in joint width (very narrow and very thick).
  4. The removal of loose segments on the stone surface.
  5. The curing and protection of repointed masonry.
  6. The repointing of all masonry vestiges encountered during excavation work.

#### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

1. Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
2. Make mock-ups of the masonry structures as required in section 01 45 00.
3. Product Data :
  1. Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
4. Samples :
  1. Provide labelled samples of materials used on project for approval before work commences.
  2. Make mock-ups of the structure prior to the beginning of construction and under the supervision of the Departmental Representative in order to demonstrate that the methods, processes, techniques and proportions specified have been understood and that they comply with the supplier's technical data sheets.
  3. Make a 1.5 m X 1.5 m mock-up showing the repointing techniques at least one (1) week prior to the repointing work. Make the mock-up at the location indicated by the Departmental Representative.
  4. Once accepted, the mock-up will be the quality standard to match during construction.
5. Test and Evaluation Reports :
  1. Provide certified test reports showing compliance with specified performance characteristics and physical properties.
  2. Provide laboratory test reports certifying compliance of mortar ingredients with specifications requirements.

#### 1.5 QUALITY ASSURANCE

1. Sample of the work
  1. Refer to section 04 03 08 *Historic - Mortaring* and 04 03 42 *Historic - Replacing Stone* regarding the results of the work.

#### 1.6 DELIVERY, STORAGE AND HANDLING

1. Delivery and Acceptance Requirements:
  1. Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
  2. Store cementitious materials and aggregates in accordance with CAN/CSA A23.1.
  3. Store materials in a dry area in such a way as to ensure they do not rest directly on the ground. Protect the material against weather, frost and any other source of contamination.
  4. Upon reception, ensure that manufacturer seals and tags are unbroken and intact.
  5. Remove rejected or contaminated material from site.
  6. At the end of every work day, cover the unprotected sections of the work with waterproof membranes. The latter must exceed the targeted area by 0.5 meters and must be installed in such a way as to form a watertight barrier to prevent the finished work from drying too quickly.

## **1.7 AMBIENT CONDITIONS**

1. Maintain masonry temperature between 10 degrees C and 25 degrees C for duration of work. When temperature is below 5 degrees C, cover and heat the application area at a minimum temperature of 5 degrees C as instructed by the Departmental Representative.
2. When ambient temperature is below 5 degrees C, store and prepare the components of the mortar and masonry elements for immediate use in heated areas, in accordance with the requirements described here and also in the A371 standard table, 24 hours a day. In addition, comply with the most stringent requirements of the said table or listed below:
  1. Let the materials reach a temperature of at least 10 degrees C before placement.
  2. Above 5 degrees C: Build in accordance with regular methods and cover the walls with sheets of plastic or tarps in order to keep water from penetrating and protect against the effects of wind.
  3. Between 0 and 5 degrees C: Heat the sand or the mixing water in order to produce a mortar with a temperature ranging between 20 degrees C and 70 degrees C until use. Cover the walls and materials with sheets of plastic or tarps to keep them from getting wet or to keep them from freezing.
  4. Below 0 degrees C: Heat the sand and mixing water in order to produce a mortar with a temperature ranging between 20 degrees C and 70 degrees C until use. When the wind speed will exceed 25 km/h during the execution of the work, install windbreaks. Cover the walls with sheets of plastic or tarps. Keep the masonry protected from frost, above 0 degrees C, for at least 7 days.
  5. Below -7 degrees C: In addition to the provisions mentioned in the previous item, heat the masonry units to a minimum temperature of 7 degrees C. Enclosures and auxiliary heating devices will be installed to maintain the temperature.
  6. Maintain these temperature levels for 7 days following the completion of the work.
3. Provide the required temporary enclosures and heating systems to maintain the prescribed temperature. Continuous temperature measurement devices will be installed in several locations inside the heated enclosures and they will be accessible and operational for the entire duration of the work. Monitoring will be continuous during periods when workers will not be required on site, at the expense of the General Contractor.
4. Ensure that the masonry is not overheated.

## **PART 2 - PRODUCTS**

### **2.1 MORTAR**

1. Mortar: in accordance with CAN/CSA A179 Section 04 03 08 - Historic - Mortaring.
2. Proportion Specification :
  1. In accordance with CAN/CSA A179 Section 04 03 08 - Historic - Mortaring.

### **2.2 STONES**

1. Refer to Section 04 03 42 for specifications regarding replacement stones for the support structures and related structures, which will require joint repointing.



## **PART 3 - EXECUTION**

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

1. Report in writing to Departmental Representative areas of deteriorated masonry not previously identified.
2. Stop work in that area and report to Departmental Representative immediately evidence of hazardous materials.

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

1. Ensure the protection of existing structures in accordance with contract requirements and recommendations, if any, of the Departmental Representative.
2. Protection against humidity
  1. As the masonry is not completed or protected by flashings or other permanent construction, keep them dry with waterproof tarps that do not stain, which extend beyond the top and sides of the works on a distance sufficient to protect them against the rain driven by the wind.
  2. At the end of each workday, cover fully or partially completed structures, which are not protected by an enclosure or shelter with waterproof and securely fixed tarps.
  3. Protecting structures to maintain the recommended room temperature in this section or other related.

### **3.3 SPECIAL TECHNIQUES**

1. Examine mortar joints.
  1. Examine horizontal and vertical joints to determine which were struck first and whether they are the same style, as well as aspects of workmanship which establish authenticity of original work.
  2. Replicate the style selected by Departmental Representative.
2. Test mortar joints.
  1. Procedure of testing: examine joints visually for obvious signs of deteriorated masonry.
  2. Test joints not visually deteriorated as follows :
    1. Test for voids and weakness by using hammers or other approved means.
    2. Perform testing in co-operation with Departmental Representative so that unsound joints can be marked and recorded.

### **3.4 RAKING JOINTS**

1. Use manual raking tool to obtain clean masonry surfaces.
  1. Remove deteriorated and adhered mortar from masonry surfaces to sound mortar full depth of deteriorated mortar but in no case less than 50 mm 4x joint thickness leaving square corners and flat surface at back of cut.
  2. Clean out voids and cavities encountered.
2. Remove mortar without chipping, altering or damaging masonry units.
3. Clean surfaces of joints by compressed air with non-ferrous brush by moderate water wash 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.

### **3.5 REPOINTING**

1. Dampen joints and porous masonry units.
2. Keep masonry damp while pointing is being performed.
3. Completely fill joint with mortar.
  1. If surface of masonry units has worn rounded edges keep pointing back from surface to keep same width of joint.
  2. Avoid feather edges.
  3. Pack mortar solidly 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.
5. Finish joints to match existing profile.
  1. Tool, compact and finish using jointing tool to force mortar into joint.
6. Remove excess mortar from masonry face before it sets.

### **3.6 RE-INSTALLATION OR REPLACEMENT OF DETACHED MASONRY ELEMENTS**

1. Reposition the restored masonry elements to their proper place using waterlogged wooden wedges or a firm mortar.
2. Place the firm mortar and compress it to a depth of 50 mm from the joint surface. Let the mortar set for 24 hours.
3. Remove the wooden wedges when they will be dry and will have shrunk.
4. Repoint up to the face of the elements using two layers of mortar.

### **3.7 PROTECTION DURING CURING PROCESS**

1. Cover completed and partially completed work not enclosed or sheltered at end of each work day.
  1. Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent the 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 to reach mortar in joints.
3. Anchor coverings securely in position.
4. Protect from drying winds. Pay particular attention at corners of structure.

5. Maintain ambient temperature of minimum 5 degrees C after repointing masonry for:
  1. Minimum seven (7) days in summer.
  2. Minimum five (5) days in cold weather conditions using dry heated enclosures.

### **3.8 CLEANING**

1. Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract 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 only if mortar has fully cured.
5. Clean masonry with low pressure 15 to 45 psi clean water and soft natural bristle brush.
6. Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.
7. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **3.9 STONE RESTORATION AND RECONSTRUCTION**

1. Repair the siding's sandstones following the removal of anchors.
2. Remove impurities, oil, grease and other contaminants that may inhibit bonding and prepare the surface in accordance with the mortar manufacturer's recommendations.
3. Dampen the surface and make repairs using clean water.
4. Mix the products in accordance with the manufacturer's recommendations.
5. The mortar will be rubbed in the substrate when filling the pores and voids. Apply the mortar using a trowel. Force the material against the edge of the repair. Smooth the surface. Once hardened, create a finish similar to that of the repaired area using stone cutting tools.

### **3.10 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 01 45 00 – Quality Control.
2. Section 04 03 07 – Historic - Masonry Repointing.
3. Section 04 03 42 – Historic - Replacing Stone.
4. Section 04 05 19 – Masonry Anchorage, Connection and Reinforcing.
5. Any other relevant specification.

### **1.2 ALTERNATES**

1. Obtain Departmental Representative'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. CSA A23.1/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  2. CAN/CSA-A179-14 Mortar and Grout for Unit Masonry.
  3. CAN/CSA-A3000-F08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
2. ASTM standards
  1. C 207, Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
  2. C 270, Standard Specification for Mortar for Unit Masonry.
  3. C 1713, Standard Specification for Mortars for the Repair of Historic Masonry.
3. "Institut de maçonnerie du Québec" (Quebec masonry institute)
  1. Building Masonry Work.
  2. Technical bulletin #7-8R.
4. NRC Institute for Research in Construction (NRC-IRC)
  1. Construction Technology Update #68.

### **1.4 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 mortar and include product characteristics, performance criteria, physical size, finish and limitations.

3. Samples :
  1. Submit samples of coloured mortar for every type of installation, restoration and reconstruction work in accordance with section 01 33 00 *Submittal Procedure*.
4. Test reports :
  1. The manufacturer of prepared and plant-packed dry components (Portland cement, lime, sand, and dyes) must provide a certificate identifying the batches or partial batches from which the material comes from, as per the prescriptions and properties listed in Item 7.2 of the A-179-94 standard and Item 9 Pre-Qualification Tests and Acceptance Criteria of the same standard with regard to mortars listed below in this section.

## 1.5 QUALITY ASSURANCE

1. Pursuant to Section 01 45 00 - Quality Control, the laboratory responsible for monitoring the quality of the mortar will be contracted by PWGSC but coordinated by the Contractor and Ministry Representative.
2. Mock-ups (reassembly mortar and repointing mortar):
  1. Construct mortar mock-ups in accordance with Section 01 45 00 - Quality Control.
  2. Submit methods of reproducing existing mortar colour, texture and pointing types, and samples.
  3. Mortar mock-ups will be made at least 40 days prior to commencing reassembly work.
  4. The mortar mock-ups for reassembly will be made prior to the reassembly work. Anticipate a sufficient number of mock-ups in order to obtain the desired characteristics.
  5. Tests will be carried out on the mortar mock-ups in order to know and master the technical characteristics. Should the mortar mock-ups fail to achieve the performance goals, the General Contractor will adjust the proportions, make new mark-ups and carry out new tests until the performance goals are achieved.
  6. Reassembly work will not be permitted before the mortar mark-ups are approved.
  7. Mock-up will be used:
    1. To judge quality of work, substrate preparation, and material application.
    2. For testing to determine compliance with performance requirements.
    3. To determine the correct proportions (lime, cement, sand, water).
    4. To confirm the quality of the product provided by the supplier.
  8. Prepare the repointing mortar mark-ups where indicated by the Departmental Representative.
  9. Notify Departmental Representative Consultant 24 hours before commencing mock-up.
    1. Obtain approval from Departmental Representative before commencing mock-up.
  10. When accepted, mock-up will demonstrate minimum standard for this Work. Approved mock-up will remain as part of finished work.
3. Mortar tests prior to the beginning of reassembly and repointing work
  1. Submit the test reports in accordance with section 01 45 00 *Quality Control*.
  2. The test results will demonstrate that the properties are appropriate for a particular mortar mix.
  3. The tests reports for each mark-up, will include:
    1. The name of the mortar's manufacturer, the product's name and the theoretical performance goals.
    2. The sieve analysis of the proposed sand.
    3. The sand dilatancy analysis.

4. The air content of the mortar mix in its plastic state.
  5. Results of the Vicat cone penetrometer test.
  6. Mortar tensile strength at 7 days and 28 days, at least 40 days prior to the beginning of the masonry work or as indicated by the Departmental Representative. Schedule delays caused by the General Contractor's failure to meet the requirements mentioned previously will not be justified, nor accepted.
  7. The results of the laboratory tests at 7 and 28 days will be handed to the Departmental Representative within a maximum of 2 business days.
4. Mortar tests during work:
1. A sand dilatancy analysis (water content) will be carried out at the delivery to the construction site, after any change in environmental conditions and as requested by the Departmental Representative.
  2. Tests regarding the mortar's air content will be carried out bi-weekly, in accordance with the ASTM C185 standard.
  3. A Vicat cone penetrometer test will be carried out four times (4) daily. There will be a minimum delay of one hour between each measurement. Out of the four (4) daily tests, the General Contractor will be responsible for two (2) tests, whereas the Departmental Representative will be responsible for two (2) tests. The Departmental Representative's two tests will be carried out using the General Contractor testing apparatus. The General Contractor will provide the Departmental Representative with the Vicat test results on a weekly basis. The results will be provided in Excel format and all of the results lower or higher than the prescribed measurement in millimeters will be highlighted.
  4. The tensile strength of all mortar types specified or used at 7 and 28 days will be tested once a week. If the mortar does not meet the tensile strength requirements at 7 days, but does meet the tensile strength requirements at 28 days, it will be accepted. If the mortar does not meet the tensile strength requirements at 7 days, based on the limit values indicated in this section of the specifications, the General Contractor will have the choice of continuing work at his own risk while waiting to find out the test results at 28 days or to disassemble the work in question.
5. Testing standards
1. Tensile strength (test cube): In accordance with the CAN/CSA-A179-14 standard.
  2. Slump resistance test: In accordance with the CAN/CSA-A179-14 standard.
  3. The General Contractor will provide all of the required technical data sheets on the mortars used. These technical sheets will be recognized by a CSA standardization.

## 1.6 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  2. Store cementitious materials and aggregates in accordance with CSA A23.1/A23.2.
  3. Protect from weather, freezing and contamination.
  4. Remove rejected or contaminated material from site.
  5. Replace defective or damaged materials with new.

## **1.7 PROTECTION MEASURES**

1. The masonry works will be wrapped in waterproof tarpaulins that will not stain. The tarpaulins will cover the walls and will extend sufficiently (by at least 600 mm on each side) to protect against rain carried by the wind as long as the work is not complete.
2. Protect the masonry works and adjacent works against scratches and any other damage. Protect the finished works against splashes of mortar.
3. Provide temporary support for the masonry works until the lateral and permanent supports are installed.

## **1.8 ENVIRONMENTAL REQUIREMENTS**

1. Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding the use, handling, storage and disposal of hazardous materials, as well as the labeling and provision of Material Safety Data Sheets.

## **1.9 WASTE MANAGEMENT AND DISPOSAL**

1. Sort and recycle the waste in accordance with section 01 74 21 *Construction/Demolition Waste Management and Disposal*.

## **1.10 ACCEPTABLE MATERIALS OR PRODUCTS**

1. When acceptable materials or products are prescribed by trademark, consult the instructions to the bidders in order to verify the procedure regarding requests for replacement product approval.

## **1.11 SITE CONDITIONS**

1. Ambient conditions: When ambient temperatures are below 10 degrees C, 24 hours a day, store and prepare mortar components and masonry elements for immediate use in heated enclosures, as per the requirements listed below:
  1. Maintain the mortar at a temperature ranging between 10 and 50 degrees C, until the material is used or grout lift.
  2. Maintain the masonry and components to a temperature ranging between 10 and 50 degrees C and protect the area against the wind cooling effect.
  3. Maintain the existing masonry (massive masonry wall) and masonry elements to be integrated into the project at a temperature above 5 degrees C during at least seven (7) days after the application of the mortar.
  4. Provide an enclosure protected against the weather to store the material and mix the mortar. Maintain the ambient temperature in the enclosure above 5 degrees C at all times.
  5. Keep the thermometers at maximum/minimum and the hygrometers on the premises and in the enclosures.
    1. Keep daily records of temperatures and humidity.
    2. Install the relative humidity and temperature measuring devices, record the temperatures and humidity and submit a report to the Departmental Representative.
2. Application in hot weather
  1. Cover the newly built masonry works with a waterproof tarp to keep them from drying too quickly.

2. Unfinished masonry works or unprotected by flashings or any other permanent construction will be kept dry using waterproof tarps, which will not stain and sufficiently exceed the top and sides of the works to protect the latter against rain pushed by the wind.
3. Spray the mortar joints regularly in order to keep them moist during at least three days after application.
3. Placement in cold temperatures
  1. When daily temperatures are:
    1. Above 5 °C: Build in accordance with usual methods and cover the walls with plastic sheets or tarps in order to keep water from penetrating and protect against the wind.
    2. Between 0 °C and 5 °C: Heat the sand or mixing water in order to product a mortar with a temperature ranging between 20 °C and 70 °C until use. Cover the walls and materials with plastic sheets or tarps in order to keep them from getting wet or from freezing.
    3. Below 0°C: Heat the sand or mixing water in order to product a mortar with a temperature ranging between 20 °C and 70 °C until use. When the wind speed will exceed 25 km/h during the execution of the work, build windbreaks. Cover the walls and materials with plastic sheets or tarps. Keep the masonry protected against frost, above 0 °C, for at least 7 days.
    4. Below -7 °C: In addition to the provisions mentioned in the previous item, heat the masonry units to a minimum temperature of 7 °C. Enclosures and auxiliary heating devices will be installed to maintain the temperature.
    5. Maintain these temperature levels for 7 days after the completion of the work.
  4. Provide the required temporary enclosures and heating systems to maintain the prescribed temperature. Continuous temperature measurement devices will be installed in several locations inside the heated enclosures and they will be accessible and operational for the entire duration of the work. Monitoring will be continuous during periods when workers will not be required on site, at the expense of the General Contractor.
  5. Ensure that the masonry is not overheated.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

1. Materials of the same make and aggregates of the same supply source will be used for all of the work.
2. Water: potable, clean and free from ice, oils, organic matter, sediments or any other contaminants.
3. Sand: Fine sand with particle size consistent with the indications in the table below and in accordance with the CAN/CSA-A179 standard.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4 (4.75 mm)	100	0
No. 8	90	10
No. 16 (1.18 mm)	70	20
No. 30 (600 µm)	50	20
No. 50 (300 µm)	30	20
No. 100 (150 µm)	15	15
No. 200 (75 µm)	0	15

1. Sharp, screened and washed pit sand, free of organic material, with final grading and colour.



2. Custom blend sands where necessary to provide appropriate colour match and gradation to approval review.
4. Portland cement: In accordance with the CAN/CSA-A3000 standard. Cement that does not stain, GU type for above ground and underground masonry.
5. Lime: Type S hydrated lime, in accordance with the requirements of the ASTM C-207-11 standard.
6. Mortar
  1. Assembly and repointing mortar (underground and above ground): Prepared in accordance with the specifications regarding proportions, consisting of 1 part Portland cement, 2 parts lime and 6 parts sand, in accordance with the requirements of the CSA A-179-14 standard (mixed and packaged at the factory). Compressive strength goal (at the construction site) ranging between 4.0 MPa and 6 MPa at 28 days. The acceptable strength range at 28 days will be between 3.5 and 8 MPa.
  2. Restoration mortar and for sandstone reconstitution: Non-shrinkable, high adhesion mortar for deep repairs and thin layer finishes, without integrated polymers, coloured. For minor repairs to existing stones.
  3. Should test results be outside the acceptable limits, the Departmental Representative may require the disassembly of the affected areas.
  4. Mortar colour: The pointing mortars will have a natural colour. Colorings will not be added. The repair mortars will be of the same colour as the repaired stones.
  5. Vicat cone penetrometer test:
    1. Assembly mortar: 20 to 35mm.
    2. Pointing mortar: 18 to 25mm.
  6. Allowable air content for all mortars: 8 to 12%. Air content for plastic mixes will be measured using a meter designed to measure mortar air content in accordance with the CSA A-3004-C4 standard.
7. Additives :
  1. Obtain written approval of Departmental Representative before using additives.

## **2.2 ALLOWABLE TOLERANCES**

1. Bedding and pointing mortar:
  1. The exact water content and the appropriate consistency for the pointing mortar will be determined using a Vicat penetrometer.
  2. The mixes will be verified on a regular basis with a Vicat penetrometer during the work in order to ensure that consistency remains constant. Refer to item 1.5.2.4.3.

## **PART 3 - EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTION**

1. Compliance: Comply with the manufacturer's written information, including product technical sheets, product installation instructions written in catalogues, product installation instruction on packages and technical data sheets.

### **3.2 PLACEMENT**

1. Unless otherwise indicated, carry out mortar and grout work in accordance with the CSA A179-14 standard.

### **3.3 PROPORTIONS AND MIXING – ASSEMBLY AND REPOINTING MORTAR**

1. Mixing will be carried out using a clean mechanical mixer free of dried mortar, rust and other contaminants. Equipment will not be defrosted with salt or antifreeze agents.
2. Prepare the mortar in accordance with the instructions of the premixed materials supplier in terms of sand/water/cement and steps to take for the consecutive introduction of all of the materials in the mixer. The exact air content and appropriate consistency for pointing and assembling mortar will be determined using a Vicat penetrometer, as per the provisions mentioned previously.
3. The duration of all of the mixing sequences will be controlled with timers, not manually.
4. The mortar's water content will be determined based on the results of a Vicat penetrometer test.
5. The amount of water will be noted and used for subsequent mixes in order to ensure consistent mixes.
6. Prepare the mortar in accordance with the manufacturer's instructions and the CSA A179-14 and CSA A371-14 standards.
7. Clean all of the mixing blades and mechanical mixer parts completely between batches. There will be no residual water at the bottom of the mixer. All residual water will be removed after each batch.
8. The mortar will be mixed in a mixer for 3 to 5 minutes.

### **3.4 PLACEMENT DELAY**

1. The mortar will be placed less than 1.5 hour after mixing if the ambient temperature is higher than or equal to 25 °C, and less than 2.5 hours after mixing if the temperature is lower than or equal to 25 °C. Outside of these limits, the mortar will be discarded.

### **3.5 CURE**

1. The mortar will be moist cured immediately after the initial.
  1. During the first hours, water the mortar delicately using a sprayer.
  2. After working hours, install tarps in order to protect the masonry works during the moist cure.
  3. Curing will take at least 48 days.

### **3.6 COLOUR CONSISTENCY**

1. In order to ensure the colour consistency of the finished product, the General Contractor will:
  1. Use the same supplier for all of the mortars and grouts.
  2. Avoid adding water on the job site to modify the workability of the mortar or to regain it (re-mixing).
  3. Make sure that the amount of water in the mortar joints when smoothing is consistent.
  4. Always use a clean mixer.

### **3.7 CLEANING**

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  1. Leave Work area clean at end of each day.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3. Remove droppings and splashings using clean sponge and water.
4. Clean masonry with low pressure 15 to 45 psi clean water and soft natural bristle brush.
5. Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

### **3.8 PROTECTION OF COMPLETED WORK**

1. Cover completed and partially completed work not enclosed or sheltered at end of each work day.
2. Enclose and protect work using wetted burlap.
3. Cover with waterproof tarps to prevent weather from eroding recently laid material.
  1. Maintain tarps in place for minimum of 1 week after laying.
  2. Ensure that bottoms of tarps permit airflow to reach mortar in joints.
4. Anchor coverings securely in position.

**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 05 19 – Masonry Anchorage, Connection and Reinforcing.
4. Any other relevant specification.

### **1.2 REFERENCES**

1. CSA International
  1. CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
  2. CAN/CSA A-370-F14, Connectors for Masonry.
  3. CAN/CSA A-371-F14, Masonry Construction for Buildings.
  4. ASTM C97, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
  5. ASTM C99, Standard Test Method for Modulus of Rupture of Dimension Stone.
  6. ASTM C170, Standard Test Method for Compressive Strength of Dimension Stone.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

1. Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
2. Submit the technical data sheets of all of the stone types. These sheets will come from recognized specialized laboratories and will not be more than 24 months old. They will contain information on the chemical constituents and the physical and mechanical properties.
3. Shop Drawings :
  1. Submit drawings of the new stones and allow a delay of ten (10) business days for the Departmental Representative to review the drawings.
4. Samples :
  1. Submit samples of replacement stones not less than 30 days before masonry work begins.
    1. Submit samples of each type of stone with each type of finish at least 15 days prior to construction.
    2. The samples will be at least 250 x 250 x 500 mm in size and will show the finish of both the exposed and hidden surfaces.
    3. Submit two (2) of each type of masonry accessory specified.
    4. Submit two (2) of each type of masonry reinforcement and tie proposed for use.

### **1.4 CLOSEOUT SUBMITTALS**

1. Provide maintenance data for masonry work for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

## **1.5 QUALITY ASSURANCE**

1. Allow Departmental Representative access to mason's workshop for inspection of current work-in-progress.

## **1.6 PROTECTION OF THE STRUCTURES**

1. At the end of each work day, the completed or partially completed walls will be covered with waterproof tarps.
2. Keep the structures from drying out too quickly.
3. Protect the adjacent structures from any marking or damage caused by the work.
4. Support the masonry works temporarily in order to ensure support during and after construction, i.e. until such time as the permanent framework provides adequate support.

## **1.7 DELIVERY, STORAGE AND HANDLING**

1. Delivery and Acceptance Requirements
  1. Transport, store and handle the materials in such a way as not to alter the finish or soil them.
  2. Keep the materials dry and protect them from the weather, frost and any other source of contaminants.
  3. Do not place the stones directly on the ground.

# **PART 2 - PRODUCTS**

## **2.1 MATERIALS**

1. Source and consistency of the stones
  1. For a given surface, new stones will come from the same quarry, which will be approved by the Departmental Representative. Stone of the same type but from a different quarry may be accepted for a distinct element on the same surface, e.g. a stringcourse.
  2. Make sure that the quarry can provide material consistent in terms of quality and with characteristics corresponding to that of the existing structure. In addition, make sure that the quarry can supply the amount of material indicated on the plans and within the deadlines mentioned in contractual documents.
2. Stones
  1. Sandstone for exterior and interior siding in accordance with the ASTM C616 standard, type II, orthoquartzite with colour and texture corresponding to the existing stone marked for replacement, type "grès vert de Sillery" and extracted without blasting.
  2. The new stones for the exterior and interior siding must have the same dimensions as the existing stones but with a minimum thickness of 250 mm.
3. Stone defects
  1. All stones will be high quality, free of cracks, pick marks, natural stains or other elements altering the structural integrity of the material.
  2. The presence of a quartz vein in the stone will be accepted based on the following:

1. Maximum width of the quartz vein: 3 mm.
2. Presence of a maximum of two (2) quartz veins in stones less than 450 mm wide.
3. Presence of a maximum of three (3) quartz veins in stones more than 450 mm wide.
4. Stone for backing
  1. All stones not reusable for the siding will be used to assemble the new backing.
  2. The new stones of the backing will be sandstone reused from stone siding or limestone.
  3. The size of the stones used for the backing will range between 100 mm and 400 mm in diameter.
  4. All the faces of the stones used for the backing, whether new or reused, will be uneven with split faces.

## **2.2 FABRICATION**

1. Shape and size the stone based on the measurements and profiles of the existing stone. All of the stones marked for replacement will be of the same size as the existing stones.
2. Cut and lay the stone so that it rests on its natural bed (sediment layers will be horizontal).
3. Finish the stone by hand in order to obtain the final profile. The stones' appearance and profile will match that of the existing stone. Guillotine cut stones will not be accepted.
4. Match the variations in finish with those of the existing stone, as approved by the Departmental Representative.
5. Keep all of the free stones marked for replacement to make shims to repair existing damaged stones marked for preservation. These reused stones will also be used to assemble the backing.
6. Cut the back of the stones so that they nest in the back.

## **2.3 STONE CHARACTERISTICS**

1. Sandstone
  1. The stone must be free of sediment layers, delamination and quartz veins exceeding the criteria listed in item 2.1.3.
  2. Absorption: 0.5% maximum (in accordance with the ASTM C-97 standard).
  3. Density: 2 600 kg/m<sup>3</sup> minimum (in accordance with the ASTM C-97 standard).
  4. Compressive strength: 110 MPa minimum (in accordance with the ASTM C-170 standard).
  5. Colour: green.

## **2.4 STONE SIZE CHARACTERISTICS**

1. The size and shape of the stones are provided for reference purposes. The stones will be of the same size, shapes, and finish as the stones marked for replacement. The following list is not limited.
2. Stones for exterior siding:
  1. Bond pattern: Already decided.
  2. Height: Ranging between  $\pm 300$  mm to  $\pm 400$  mm.
  3. Width: Up to 1 400 mm.
  4. Depth: Ranging between 300 mm and 400 mm (the depth will never be less than the height of the stone) Key stones will be 800 mm deep unless otherwise indicated on the plans.

5. Surface finish: Bush hammering (medium – gross finish).

## **2.5 EXISTING STONE**

1. Refer to the elevations indicated on the plans in order to determine which stone is to be marked for preservation or replacement.
2. Stones marked for replacement: If still hard, sound and clean, the stones marked for replacement will be reused (either cut for siding or used for the core wall).

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

1. The General Contractor will bring his stone cutting sub-contractor and the stone supplier to the project kick-off meeting. The contracts between these parties will have been signed prior to the meeting.
2. Identify the lines, levels and types of foundations and take the necessary action to respect them.
3. Protect the structures located near the work executed according to the terms of this section against damages and deterioration.
4. Move and lift the stones using the means necessary to protect them against damage. Inspect the stones that have fallen or received a shock and obtain authorization for use from the Departmental Representative. Do not drill a hole or a space to receive a lifting lewis, cramps, hold-back hooks, or other lifting devices on the front or top of the stone.
5. Indicate bedding planes of stone units. Duplicate bedding marks on usable pieces of cut stone.
6. Place safety devices and signs near work area as directed in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
7. Install and remove shoring or other supports. All of the temporary shoring system required during the assembly of the masonry structures will be installed by a structural engineer hired by the General Contractor.
8. Install and remove self-supporting scaffolding in accordance with Section 01 52 00 - Construction Facilities.
9. Cover adjacent plant material and fragile surfaces.

### **3.2 REMOVAL OF THE STONES MARKED FOR REUSE**

1. Rake the mortar joints around the stones.
2. Remove the stones starting from the top of the wall. Protect and store the stones in a secure area.

### **3.3 CUTTING/SIZING OF STONE**

1. Shape and size the stones based on the stones marked for replacement.
2. The sedimentary stones will be cut on their sediment beds. Stones cut on false beds will not be accepted.
3. Use a caliper, a square and a level to measure the space to be filled. Expect to make narrow joints (between 3 mm and 5 mm), similar to the existing mortar joints.

4. The fabrication tolerances will not exceed a 2 mm difference for all sizes.
5. The finish of exposed stones will be in accordance with the provisions of item 2.4 or will match the finish of the stones marked for replacement if such information is missing.
6. After cutting, the five (5) stone faces not exposed will be bush hammered and will adhere perfectly to the mortar right up to the face's edge.
7. Free stones damaged in any way delivered to the construction site will not be accepted. Repairs to new stones will not be accepted.

### **3.4 MOVING STONES**

1. Avoid damaging the edges of the stones during lifting.
2. Moved stones marked for reuse will be stored on wood supports. A maximum of three layers of stones will be placed on each set of wood supports. The General Contractor will leave free space between the supports in order to allow circulation around them and permit inspection.

### **3.5 FABRICATION TOLERANCES**

1. Dimension stone to the following tolerances.
  1. Unit Length: plus or minus 3 mm.
  2. Unit Height: plus or minus 3 mm.
  3. Deviation from Square: plus or minus 3 mm, with measurement taken using the longest edge as the base.
  4. Bed Depth: plus or minus 3 mm.

### **3.6 STONE REPLACEMENT**

1. Prior to assembly, make sure that the stone placement and fitting patterns are understood in order to accurately reproduce the patterns of the existing structure.
2. Co-ordinate bond pattern, coursing height and joint width with existing work.
3. Clean dust and stone fragments from slot. Before proceeding with work, inspect cleaned surface with Departmental Representative.
4. Dampen slot's surfaces before applying mortar.
5. Lay heavy and protruding stones only once the mortar of the previous layers is hard enough to support their weights.
6. Support and anchor protruding stones until the mortar of the top layers is hard enough to support their weight.
7. Lay large stones on waterlogged softwood wedges to ensure that the stones are aligned correctly until the mortar hardens.
8. Remove the wedges without breaking them when the mortar is dry.
9. Install the fasteners and connectors in accordance with the CAN/CSA A-370 and CAN/CSA A-37 standards, unless otherwise indicated. The placement of these elements will be approved by the Departmental Representative before the application of the mortar.



10. Lay the stones on a layer of mortar based on the alignment of the adjacent stones or as indicated on the plans. Unless otherwise indicated, ensure that the vertical joints are of equal thickness on both sides.
11. Fill the holes left by anchors, dowels and lifting devices, as well as the voids left when correcting protruding edges.

### 3.7 FILLING AND REPOINTING

1. Do pointing work in accordance with Section 04 03 07 *Historic - Masonry Repointing*. Laying the stones and repointing surfaces in a single step will not be accepted.

### 3.8 REPOINTING

1. Dampen the masonry and keep it moist for the entire duration of the repointing work.
2. Fill the joint completely with mortar. If the edges of the masonry elements are worn and rounded, make new joints recessed from the surface in order to obtain joints of the same width, while avoiding a thinner layer of mortar at the edges. Compact the mortar and eliminate voids.
3. Keep the temperature of the masonry between 5 °C and 25 °C for the entire duration of the work.
4. Make new joints in layers not exceeding a depth of 25 mm. Let each layer set before applying the next layer.
5. Ensure that the width of the joints remains consistent to the full depth.
6. Make finishing joints in such a way as to match those of the existing structure. The minimum thickness of the finishing joints will be identical to that of the existing joints.
7. Remove all mortar splashes from the surface of the masonry elements before they harden.

### 3.9 CLEANING

1. Confirm acceptance of mock-up cleaning operations to demonstration from Departmental Representative 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. Clear site of debris, surplus material and equipment, leaving work area in clean and safe condition.

### 3.10 PROTECTION OF WORK

1. Cover top of completed and partially completed wall, not enclosed or sheltered, with weatherproof coverings at end of each working day.
  1. Drape cover over wall and extend 0.5 m down both sides.
  2. Anchor securely in position.
  3. Prevent finished work from curing too quickly.
2. Protect adjacent work from marking or damage due to work.
3. Protect adjacent finished work against damage which may be caused by on-going work.

### **3.11 BOND PATTERN**

1. The aboveground and backfilled stones of the exterior siding and the above ground stones of the interior siding will be replaced. The new stones will be the same size as those of the existing structure and laid based on the same bond pattern. In addition, the joints will be the same width as those of the existing structure.

**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 05 19 – Masonry Anchorage, Connection and Reinforcing.
4. Any other relevant specification.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

1. Submit the plans for the temporary shoring required for the dismantling and reassembly of the structure. The plans will be signed and stamped by an engineer certified by the “Ordre des Ingénieurs du Québec” and sent to the Departmental Representative for review. The engineer will be hired and paid by the General Contractor.

### **1.3 TRANSPORTATION, STORAGE AND HANDLING**

1. Protect the masonry elements and assist with their reinstallation.
2. Store the dismantled masonry elements in the designated area at the construction site. Protect the elements against water, the weather and potential mechanical damage using a shelter or by draping them in polyethylene. The elements will be placed on wooden platforms. The elements will not rest directly on the ground. If there is not enough room to store the elements at the construction site, the General Contractor will make arrangements to transport and store the elements securely outside of the construction site until they are needed at the construction site. Additional expenses related to the transportation and storage of the elements outside of the construction site will not be claimed.
3. The masonry elements marked for replacement will be reused in order to repair other elements. The removed masonry elements that will not be reused will be returned to the Departmental Representative. Masonry elements will not be disposed of without the approval of the Departmental Representative.

### **1.4 SEQUENCE AND FABRICATION**

1. The scope of the dismantling/reassembly work is indicated on the drawings. Each stone removed in the context of this project will be reinstalled in its original place and position. The original bond pattern for the dismantled masonry area will be used for reassembly using both reused and new stones. The height and width of the new stones will be identical to that of the original stoned marked for replacement and they will be laid in the same position in the wall.
2. All of the stones marked for dismantling will be identified, as well as their position. Aluminium tags of various colours will be used to mark the stones. The stone number will be engraved on the tag and the latter will be anchored at the back of the stone with a stainless steel anchor. The General Contractor will pre-drill the stones before anchoring the tag. The tag will be placed at least 50 mm from the edges of the stone.
3. Dismantling and reassembly plan: The General Contractor will hire a professional photographer to take high definition pictures and produce a photogrammetric record of the areas of the walls where masonry will be dismantled and reassembled. The General Contractor will digitally number all of the stones marked for dismantling on the photograph's photogrammetric record, which will then be sent to the Departmental Representative for verification. The stone numbers on the record will match the numbers on the aluminium tags anchored to the stones. The photogrammetric record and the dismantling/reassembly plan will be sent

to the Departmental Representative three (3) weeks prior to the beginning of the work, for approval. Dismantling the masonry before the Departmental Representative has reviewed and verified the dismantling plan and the photogrammetric record is strictly prohibited.

4. The photogrammetric record will be kept up-to-date and copies will be made after each modification.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

1. The areas and conditions in which the work will be carried out will be examined. The Departmental Representative will be notified in writing of any condition that would prevent work to be carried out in accordance with the prescriptions.

### **3.2 PREPARATION**

1. Remove deteriorated portions of stones using low impact removal methods until sound surface is reached.
2. Obtain Departmental Representative's approval for alternative methodology and tools to be employed before commencing the work.
3. Clean stone surface of dust and stone chips.

### **3.3 PROTECTION**

1. The support structures that are to remain in place and the walls that constitute them will be protected. Damages, if incurred, will be repaired.
2. Protect surrounding components from damage during work.
3. Make good damage to historic fabric.

### **3.4 TEMPORARY SHORING**

1. Construct shoring and cradling, and other temporary framing work needed to support structure, or parts of it, during removal operations and in anticipation of resetting, if structure is not to be completely dismantled, according to approved shop drawings.

### **3.5 METHOD FOR LOOSENING STONES**

1. Avoid using mortar joints (as per section 04 03 07) to loosen the stones. Used approved methods that will not damage the stones or the other architectural elements. Carefully remove the stone's peripheral mortar joints by cutting kerfs into the mortar. If the stone is still solidly set in the wall, drill holes 150 mm deep in the peripheral joint every 50 mm with a drill bit without damaging the adjacent stones. If the stone is still set after the drilling, use a saw with twin blades, such as an Arbotech saw. Remove the stones.
2. Remove all loose debris and the deteriorated mortar from the wall's exposed stone. Remove the loose masonry elements and smooth the wall's exposed stone as needed to lay new stone.

3. Do not use a circular grinder or saw, pneumatic graver or chisel, nor any metal tool that will exert pressure on the stone's edge. Obtain the approval of the Departmental Representative before using any mechanical tool prior to the beginning of the work.
4. Loosen masonry only when the surface temperature is equal to or higher than 15°C.
5. The General Contractor is responsible for the damages caused to the stoned marked for dismantling, the adjacent stone structures marked for preservation and the other adjacent construction elements. Damages, if incurred, will be repaired to the satisfaction of the Departmental Representative without additional expenses to the project.

### **3.6 HANDLING**

1. The Departmental Representative will approve the General Contractor's handling, storage and transportation strategy prior to the beginning of dismantling activities.
2. Usage of Lewis bolts for handling stone is not permitted.
3. Place detached stones on wood surfaces during handling. Prevent contact with metal.
4. When stones are lowered to ground, place directly on wooden platform used for transport or storage.
5. Transport and keep stones on wooden platforms.
6. Ensure that sharp edges of stones do not come into contact with hard objects.

### **3.7 TEMPORARY STORAGE STAGING AREA**

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.

### **3.8 REASSEMBLY OF STONES**

1. The Contractor shall pre-drill all existing stones to be re-installed in order to insert the anchor stud when reassembling. Pre-drilling prevents fragile stones from fracturing.
2. All recovered stones to be re-installed should be cleaned of any residue of mortar on their edges. This operation is delicate and must be done manually with the scissors with great care to avoid losing original.

### **3.9 CLEANING**

1. Do cleaning operations at above freezing temperature.
  1. After cleaning, protect wet stones against freezing until dry.
2. Clean stones by wet scrubbing with vegetable fibre brush unless otherwise instructed by Departmental Representative.
  1. Do not use high pressure water jet.
3. Remove excess mortar with hand tools.

### **3.10 FINAL MARKING**

1. Remove the marking aluminium tag from the stone just before reassembly.

### **3.11 STORAGE**

1. When stones are placed under shelter:
  1. Design and ventilate shelter to keep condensation from forming on internal surfaces.
2. Lay out storage so that each stone will have its numbered face visible, and be accessible or removable without having to move adjacent stones.
3. Show layout of stones to be stored on record drawing.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. The provisions of the general requirements and of the additional requirements apply to this section of the specifications as if they were reproduce in their entirety.
2. Section 04 03 06 – Historic works – Masonry cleaning.
3. Section 04 03 07– Historic works – Masonry repointing and repair.
4. Section 04 03 08 – Historic works – Mortaring.
5. Section 04 03 42 – Historic works – Replacement of Stone.
6. Section 04 03 43 – Historic works – Dismantling of stone masonry.
7. Section 04 05 19 – Masonry Anchorage, Connection and Reinforcing.

### **1.2 SUBMITTALS**

1. Submit documents and samples in accordance with Section 01 33 00 – Submittal Procedures and as specified in related Sections.
2. Refer to the relevant sections in division 04 regarding all that pertains to the submittal of shop drawings.
3. In addition to all samples enumerated in other sections of Division 4 of specifications, submit the following samples:
  1. One of each type of masonry reinforcings, accessories, and anchors.
  2. One of each mortar constituent (Portland Cement, Lime, Sand) in 500 ml plastic container with screw top lid.
  3. Three of each type of stone, sized and shaped to match existing stone units with direction of bedding marked. Indicate visible markings and finish.
  4. One of each type of cleaning material in 250 ml container with safety screw caps.
  5. One of each type of proprietary product including mortars, anchors and consolidation materials.
4. Scheduling:
  1. Include materials supply date, date of completion of shop fabrication and date of delivery to site.
  2. Include dates of works mock ups period (4 weeks) before beginning of masonry works.
  3. Include date of masonry cleaning.
  4. Include periods of obligatory approvals by Departmental Representative.
  5. Include the following activities: works on foundation walls, beginning and ending of dismantling/rebuilding by sections, beginning and ending of repointing works indicating curing period, beginning and ending of stone repairing works by sections.
  6. Periods of deficiencies corrections.
5. Manufacturer's Instructions: Submit manufacturer's installation instructions.

6. Test Reports: Submit certified test reports showing compliance of materials with specified performance characteristics and physical properties.

### **1.3 QUALITY ASSURANCE EXECUTION**

1. Perform work in accordance with the provisions of section 01 45 00 – Quality Control.
2. Perform work under the supervision of the Departmental Representative.
3. Perform work in accordance with established procedures for historic masonry conservation and The Standards and Guidelines for the Conservation of Historic Places in Canada, published by Parks Canada.
4. Shoring and cradling, and other temporary framing work needed to support the structure and bearing masonry element shall be designed by a qualified structural engineer, recognized, hired and paid by the general contractor, familiar with historic masonry structures and licensed to practise in the Province of Québec. Drawings to be stamped and signed by the aforementioned engineer.

### **1.4 QUALITY ASSURANCE - INSPECTIONS**

1. Make mason's workshop accessible to Departmental Representative for review of current work-in-progress.

### **1.5 QUALITY ASSURANCE - LABOR**

1. The ratio of masons apprentice or junior (at least 3 years of experience) by mason companion or mason senior (more than 10 years of experience) must be 1 for 2. Masonry contractor is not authorized to leave masons apprentices/ juniors without supervision of a mason companion or senior. Departmental Representative will require from contractor to respect the ratio of 1 for 2 (ex: for 20 masons apprentices or juniors of less than 3 years of experience, there must be 10 masons companion or senior of more than 10 years of experience).
2. Contractor must schedule a start-up meeting with Departmental representative and the stone supplier within 2 weeks of the awarding of the contract to the General Contractor by the PWGSC. The goal is to ensure that all of the parties understand the needs of the project and that they quickly make all of the necessary efforts to start the project and meet the delivery deadlines.
3. The masonry contractor will demonstrate his qualifications and provide three (3) historic masonry restoration projects awarded to him in the last ten (10) years and with the same scope of work and level of complexity as this contract.

### **1.6 DELIVERY, STORAGE AND HANDLING**

1. Deliver materials to job site in dry condition.
2. Storage and Protection:
  1. Keep materials dry until use except where wetting of bricks or stone is specified. Protect from freezing and contamination.
  2. Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
3. Do not use materials which have exceeded manufacturer's recommended shelf life.
4. Comply with the requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous material; and regarding labelling and the provision of Material Safety Data Sheets.



## **1.7 WASTE MANAGEMENT AND DISPOSAL**

1. Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.8 WORKING CONDITIONS (TEMPERATURE AND HUMIDITY)**

1. Execute all mortar work in accordance with the provisions of section 04 03 08.
2. When ambient conditions do not meet requirements, provide enclosure system around curing area to ensure that stated environmental conditions are maintained for curing period. Take precautions to avoid overheating masonry.
  1. The use of heated temporary enclosures to maintain ambient and surface temperatures above 10°C in cold weather is subject to the written approval of the material manufacturer and the Departmental Representative.
  2. Submit enclosure system for approval from Departmental Representative in accordance with Section 01 33 00 - Submittal Procedures.
3. Remove work exposed to lower temperatures as directed by the Departmental Representative.
4. Install thermometers and relative humidity probes at every 2 levels in the exterior scaffoldings and at each 7 meters of distance from one to the other on the same storey of scaffoldings in exterior conditions. A thermometer and relative humidity probe must be installed in each interior room where masonry works are being held. Checking and temperature and relative humidity must be done at each hour even during the night (24 hours /24 and 7 days on 7 during all duration of masonry works.). The contractor must transmit all data of all thermometers and probes on a weekly basis in Excel format to Departmental representative. All readings under 15 °C and over 25°C must be highlighted in the Excel file.
5. Obtain approval from Departmental Representative for methods of protection and fabrication of enclosures.
6. Hot Weather Requirements:
  1. Protect repair mortar from direct sunlight and wind when the ambient air temperature exceeds 21°C.
  2. Use protection methods acceptable to the Departmental Representative.
  3. Keep repaired area humid for a period of 7 days for a proper cure.
  4. Do not use or prepare mortar when the ambient air temperature is above 32°C at the location of the work.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Refer to related sections for stone, mortar, related materials, accessories and material preparation procedures.
2. Burlap: clean, non-staining, free of printed matter, to Departmental Representative's approval.
3. Plumber's hemp: asbestos-free, oil- free jute rope.

### **2.2 SOURCE QUALITY CONTROL**

1. Retain purchase orders, invoices, suppliers test certificates and documents to prove that materials used in contract meet requirements of specification.

2. Produce above upon request by Departmental Representative and allow free access to sources where materials were procured.

## **PART 3 - EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

1. Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

### **3.2 SITE VERIFICATION CONDITIONS**

1. Report in writing, to Departmental Representative, areas of deteriorated masonry revealed and not conforming to specified requirements of the Work.
2. Once the scaffold is set up, providing access to all walls areas, obtain Departmental Representative's review, approval and instructions for each specified repair and replacement of masonry units before proceeding with work.
3. Obtain Departmental Representative's review and approval after the raking out of the mortar joints and prior the backpointing / repointing work. See section 04 03 07 for complementary information.

### **3.3 PREPARATION WORKS**

1. Take utmost care not to damage historic fabric. If need be, repair any damage.
2. Seal and protect openings, doors, windows, and adjacent areas to prevent damage and spread of construction dust, water or other materials into the building.
3. Cover sills and projecting courses with rigid protection, secured into joints, for duration of work.
4. Prevent scaffolding, hoists or construction equipment from bearing directly against masonry or roof. Provide lumber or plywood with padding of sufficient thickness to prevent damage.

### **3.4 INSTALLATION**

1. Do masonry work in accordance with CSA-A371 except where specified otherwise.
2. Build masonry plumb, level, and true to line, with vertical joints in alignment.
3. Lay out coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.
4. Prevent materials from entering or penetrating the caponieres. Report findings of materials to Departmental Representative before continuing with work.

### **3.5 CONSTRUCTION**

1. Remove, repair and replace masonry as indicated.
2. Jointing:
  1. Allow joints to set just enough to remove excess water, then finish joint as specified.
  2. Finish stone joints as specified in Section 04 03 07 – Historic Masonry Repointing and Repair.

3. Cutting:
  1. Make brick cuts straight, clean, and free from uneven edges.
4. Building-In:
  1. Build in items required to be built into masonry.
  2. Prevent displacement of built- in items during construction. Check plumb, location and alignment frequently, as work progresses.
5. Support of loads:
  1. Use grout to CSA A179 where grout is used in lieu of solid units.
6. Interface with other work:
  1. Cut openings in existing work as indicated on drawings.

### **3.6 FIELD QUALITY CONTROL**

1. Testing on all types of mortars and grouts in the project (grouting, bedding mortar, front pointing mortar and backpointing mortar) shall be carried out by a Testing Laboratory and engaged by PWGSC. Tests on masonry elements will be in accordance with the requirements of section 04 03 08 of these specifications.
2. Prepare and update a register including a drawing of elevations on which the positions of « data-logger » will be marked as well as dates of beginnings of humid curing of mortars for a given sector. Update and transmit once a week to Departmental Representative.
3. Inspection and tests of mortar will be done by a testing laboratory designated by the Departmental Representative, in compliance with CSA A179 standard.
4. Air content for all mortars containing lime and Vicat cone penetration tests for the mortars used in stone works must be tested at the same frequency as testings for resistance, or more often according to requirement of Departmental Representative and other quote sections.
5. Contractor must possess and have on the site a penetrometer Vicat functional and well maintained for the whole duration of works of the project.

### **3.7 CLEANING**

1. Perform cleaning after installation to remove construction and accumulated environmental dirt.
2. Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**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.
4. Any other relevant specification.

### **1.2 REFERENCES**

1. Canadian Standards Association CSA International
  1. CAN/CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  2. CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
  3. CAN/CSA A370-14, Connectors for Masonry.
  4. CAN/CSA A371-14, Masonry Construction for Buildings.
  5. CAN/CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.
  6. CSA-S304.1-14, Design of Masonry Structures.
  7. CSA W186-FM1990 (C2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

1. Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
2. Product Data:
  1. Provide manufacturer's printed product literature, specifications and datasheets illustrating products to be incorporated into project for specified products.
  2. Provide two copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS) in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
3. Shop Drawings:
  1. Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  2. Provide drawings stamped and signed by professional engineer registered or licensed in Province of Quebec of Canada.
  3. Provide shop drawings detailing bar bending details, anchorage details lists and placing drawings.
  4. On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
4. Samples:
  1. Provide samples in accordance with Section 01 33 00 - Submittal Procedures, supplemented as follows.
  2. Two (2) samples of each proposed type of framework, connector and anchor.

5. Manufacturer's Instructions:
  1. Provide manufacturer's installation instructions.

#### **1.4 QUALITY ASSURANCE**

1. Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
3. Mock-ups :
  1. Construct mock-ups in accordance with the requirements of related masonry sections and incorporate accessories covered by this section.

#### **1.5 FIELD MEASUREMENTS**

1. Make field measurements necessary to ensure proper fit of members.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

1. Stone anchor rods: Grade 316 stainless steel in accordance with the CAN/CSA A370 standard, as indicated on the structural engineering drawings.
2. Anchors: In accordance with the CAN/CSA A370 standard.
  1. The anchors will be 10 mm in diameter. Install in accordance with the specifications listed in the drawings. Install the rods via the top surface of the new stones. Anchors will not be visible on the stone facades.
3. Adhesive for stone anchors: Two-component, fast drying adhesive compliant with code IBC 2006, 30 minutes at 68°F (minimum values).
  1. Compressive strength: 70 N/mm<sup>2</sup>.
  2. Elasticity modulus: 1 350 N/mm<sup>2</sup>.
  3. Pull-out strength: 2.75 %.

### **PART 3 - EXECUTION**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

1. Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

#### **3.2 PREPARATION**

1. Direct and coordinate placement of metal anchors for masonry supplied to other Sections.

### **3.3 INSTALLATION**

1. Supply and install masonry connectors and reinforcement in accordance with CAN/CSA A370, CAN/CSA A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.
2. Prior to placing concrete, mortar, grout, obtain Departmental Representative's, approval of placement of reinforcement and connectors.
3. Supply and install additional reinforcement to masonry as indicated.

### **3.4 BONDING AND TYING**

1. Bond walls of two or more wythes using metal connectors in accordance with CSA-S304.1, CAN/CSA A371 and as indicated.

### **3.5 ANCHORS**

1. Supply and install metal anchors in accordance with CAN/CSA A370 and CAN/CSA A371 as indicated.

### **3.6 FIELD BENDING**

1. Do not field bend reinforcement and connectors except where indicated or authorized by Departmental Representative.
2. When field bending is authorized, bend without heat, applying a slow and steady pressure.
3. Replace bars and connectors which develop cracks or splits.

### **3.7 FIELD QUALITY CONTROL**

1. Obtain Departmental Representative approval of placement of reinforcement and connectors, prior to placing mortar grout.

### **3.8 CLEANING**

1. Clean in accordance with Section 01 74 11 - Cleaning.
  1. Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

## **PART 1 - MATERIAL**

### **1.1 GENERAL**

1. Fiber-reinforced plastic (FRP) armour bars will be made of a fiberglass-reinforced polymer matrix consisting of only one type of continuous fibre.

### **1.2 POLYMER**

1. The base polymer will be a vinylester resin. Various mixes of resins will not be authorized.

### **1.3 FINISH**

1. The FRP rods will have a high roughness finish in order to increase the binding strength to the concrete or masonry.
2. The bonding coefficient ( $k_b$ ) of the FRP bars will be 0.8.

### **1.4 ADDITIVES**

1. Additives appropriate for the resin system used may be used in the polymer. The following additives are authorized:
  1. Catalysts.
  2. Accelerants.
  3. Hardeners.
  4. Initiators.
  5. Coupling agents.
  6. Wetting agents.
  7. Parting compounds or release agents.
  8. Fire-resistant products.
  9. Pigments.
  10. UV blockers.

## **PART 2 - FABRICATION**

### **2.1 METHOD**

1. The fabrication method will be closed or open molding.
2. The FRP bars will meet the requirements of CSA standards S807-10 "Specifications for fibre-reinforced polymers" and S806-12 "Design and construction of building structures with fibre-reinforced polymers".

### **2.2 PRODUCT CHANGE OR CHANGE IN THE FABRICATION PROCESS**

1. New qualification tests on the product will be carried out if changes are introduced to the product's list of constituents (type of resin, type of mesh) or to the fabrication process.

## **2.3 QUALITY CONTROL**

1. The fabrication processes will be certified ISO 9001, from the delivery of the raw material up to the shipping of the rods. Each fabrication process will be monitored by a control plan and qualified staff. Production and monitoring records will be kept and used to facilitate the tracking of history and batches.

## **2.4 STORAGE AND HANDLING**

1. At all times, the rods will be protected from direct sunlight (or from any other significant source of UV rays) and prolonged immersion, as well as any other cause of damage.

# **PART 3 - PACKING**

## **3.1 LABELING**

1. The straight FRP will be labeled separately so that the size, the batch number and manufacturer will be easily identified by the Owner. The bent FRP rods will be grouped based on type and size. Each group will be correctly labeled with a durable tag.

## **3.2 SHIPPING**

1. The shipping of the FRP rods will be carried out with the same handling care as described in section 2.5.

# **PART 4 - QUALIFICATION TESTING**

## **4.1 SAMPLES**

1. At least 24 samples will be tested in order to confirm the mechanical properties of the FRP bars. The samples will be selected in three separate production batches. The preparation of the samples and the testing methods will be in accordance with the requirements of CSA standards S806 and S807.

## **4.2 MINIMUM TENSILE STRENGTH (GUARANTEED)**

1. The guaranteed minimum tensile strength is defined as being the average resistance minus three times the standard deviation.

## **4.3 MINIMUM ELASTICITY MODULUS (SPECIFIED)**

1. The average value of the test elasticity modulus is defined as the specified elasticity modulus if the variation coefficient is lower than 5%. If the said coefficient is higher than 5%, the specified elasticity modulus will be defined as the average elasticity modulus minus three times the standard deviation.



#### 4.4 MINIMUM MECHANICAL PROPERTIES

**Table 1: Minimum Mechanical Properties of the Grade 1 FRP Bars**

Bar Size	Nominal Area of the Section (mm <sup>2</sup> )	Straight Rods		Bent Rods		
				Straight Sections		Bent Sections
		Tensile Strength (MPa)	Elasticity Modulus (GPa)	Tensile Strength (MPa)	Elasticity Modulus (GPa)	Tensile Strength (MPa)
#3	71,3	1020	47	N/A	N/A	N/A
#4	126,7	1010	41	N/A	N/A	N/A
#5	197,9	N/A	N/A	N/A	N/A	N/A
#6	285,0	N/A	N/A	N/A	N/A	N/A
#8	506,7	N/A	N/A	N/A	N/A	N/A

**Table 2: Minimum Mechanical Properties of the Grade 3 FRP Bars**

Bar Size	Nominal Area of the Section (mm <sup>2</sup> )	Straight Rods		Bent Rods		
				Straight Sections		Bent Sections
		Tensile Strength (MPa)	Elasticity Modulus (GPa)	Tensile Strength (MPa)	Elasticity Modulus (GPa)	Tensile Strength (MPa)
#3	71.3	1310	63	1020	50	460
#4	126.7	1280	61	1020	50	460
#5	197.9	1260	61	1000	50	450
#6	285.0	1270	61	1030	50	460
#8	506.7	1260	61	990	50	450

## PART 5 - INSPECTION

### 5.1 TEST AND CONTROL RECORDS

- The manufacturer will keep records on:
  - Raw material approvals.
  - The proportions of the polymer mix.
  - The inspection at the beginning of production.
  - Regular inspections during productions.
  - The final inspection.
  - The Certificates of Conformity.
- All of the test and control records will be identified in order to facilitate follow-up in times and will include the batch number as a reference. These records will be kept for a minimum of 5 years after production.

### 5.2 INSPECTION BY THE DEPARTMENTAL REPRESENTATIVE

- The Departmental Representative may carry out tests and inspect the rods in order to confirm that the products are in accordance with the requirements of this specification and with his own requirements. The manufacturer will provide any assistance required during the Departmental Representative's inspections.

### 5.3 CONFORMITY CRITERIA

1. Each separate test result obtained for quality control purposes will be higher or equal to the results for the tests listed in Tables 1 and 2. Each separate test result obtained for qualification purposes, including the guaranteed tensile strength, will be higher or equal to the results for the tests listed in Tables 1 and 2.
2. The average values and standard deviations calculated for each property will be submitted for information purposes only.
3. Should there be differences between the manufacturer's certificate and the results of the tests performed by the Owner, which would lead to a refusal of the product, the Departmental Representative will quickly notify the manufacturer in writing. The decision to refuse the rods will be made before the rods are used in any way in the context of this project.

## PART 6 - REPORTS

### 6.1 QUALITY CONTROL TEST REPORTS

1. The manufacturer will confirm that each production batch was fabricated and tested in accordance with the requirements of this specification. The test report (Certificate of Conformity) will include the information listed in the items below. The certificate will be signed by the manufacturer.
  1. Materials
    1. The Certificate of Conformity will include the following information:
      1. The diameter of the bar.
      2. The grade.
      3. The type of resin.
      4. The type of fibre.
    2. Production
      1. The Certificate of Conformity will include the following information:
        1. The fabrication process.
        2. The definition of a production batch.
        3. The total length fabricated for each batch.
        4. Les dates de début et de fin de la production.
  2. Test Results
    1. The Certificate of Conformity will include the following information:
      1. Number of samples tested.
      2. Result for each test.
      3. Mean value for each property.
      4. Standard deviation for each property.
      5. Minimum tensile strength (guaranteed).
      6. Standard deviations of the testing method (if applicable).
      7. Statement to the effect that the product meets the requirements of this specification.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. Section 03 30 00 – Cast-in-place Concrete.
2. All of the sections in Division 01 of these specifications.

### **1.2 REFERENCE STANDARDS**

1. American Society for Testing and Materials International, (ASTM).
  1. ASTM D 2369-[03], Test Method for Volatile Content of Coatings.
  2. ASTM D 2832-[92(R1999)], Guide for Determining Volatile and Non-volatile Content of Paint and Related Coatings.
2. Canadian General Standards Board (CGSB).
  1. CAN/CGSB-37-GP-37M-[77], Application of Hot Asphalt for Dampproofing or Waterproofing.
  2. CAN/CGSB-37-GP-6Ma-[83], Asphalt, Cutback, Unfilled, for Dampproofing.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

1. Product Data:
  1. Submit manufacturer's instructions, printed product literature and data sheets for the products, in accordance with section 01 33 00 *Submittal Procedures*.
  2. Submit two (2) copies of Material Safety Data Sheets as per the terms of the Workplace Hazardous Materials Information System (WHMIS) and in accordance with section 01 33 00 *Submittal Procedures*. The MSDS will indicate VOC's for water repellent.
2. Manufacturer's Instructions:
  1. Submit manufacturer's installation instructions.

### **1.4 QUALITY ASSURANCE**

1. Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
3. Meeting prior to commencing work: A meeting will be held during which the work requirements, the manufacturer's installation instructions and terms of warranty will be discussed.

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

1. Storage and protection
  1. Deliver, store and handle materials as instructed by the manufacturer.
  2. Protect the products against frost.

## 1.6 WASTE MANAGEMENT AND DISPOSAL

1. Sort the waste material for recycling, in accordance with section 01 74 21 *Construction / Demolition Waste Management and Disposal*.
2. Remove all packing material from the construction site and transport them to appropriate recycling facilities.
3. Place packing material in appropriate recycling bins at the construction site, in accordance with the waste management plan.
4. Transport the unused water repellent products to a suitable hazardous materials disposal center approved by the Departmental Representative.
5. Pouring unused water repellent products in sewers, lakes, watercourses, on the ground and at any location where this could cause health or environmental risks is strictly prohibited.

## 1.7 SITE CONDITIONS

1. Ambient conditions:
  1. Maintain substrate temperature at water repellent installation area in accordance with water repellent manufacturer's printed instructions.
  2. Apply coating during dry weather. Allow surfaces to dry for a minimum of 3 days after rainfall or cleaning before applying additional coats.
  3. Protect plants and vegetation which might be damaged by water repellents.
  4. Protect surfaces not intended to have application of water repellents.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

1. Membrane on top of the masonry wall, on projection wall, as well as under and on top of the concrete coping:
  1. Hot applied, rubberized asphalt (4.8 mm thick but no less than 3.2 mm thick) in accordance with the CAN/CGSB-37.50 standard.
  2. Colour: Black.
  3. Flash point: 240°C CGSB 37.50-M89.
  4. Permeability to water vapour: 1.7 ng/Pa(s)m max CGSB 37.50-M89.
  5. Pull-out strength: 1000 % min. ASTM D-5329.
2. Geomembrane for drainage behind the masonry walls:
  1. Low density, smooth polyethylene geomembrane, 0.45 minimum thickness with a minimum density of 400 g/m<sup>2</sup>. The geomembrane will be wrapped on top and under a nonwoven polypropylene geotextile with a breaking strength higher than 550N and a tear strength higher than 250N.

## PART 3 - EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

1. Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

### **3.2 PREPARATION**

1. Prepare and clean substrate surfaces in accordance with water repellent manufacturer's printed instructions.
2. Protect all of the existing structures adequately prior to the application of the membrane. Pay particular attention to the protection of the newly rebuilt masonry wall prior to the application of the liquid membrane under the coping.

### **3.3 APPLICATION**

1. Apply one (1) continuous and monolithic 4.8 mm thick (but no less than 3.2 mm thick) coat of water repellent using a roller.

### **3.4 FIELD QUALITY CONTROL**

1. After water repellent has dried, spray coated surfaces with water to verify coating coverage. Allow the Departmental Representative to witness tests.

### **3.5 CLEANING**

1. Once the installation and construction work complete, remove surplus and waste material, tools and safety fences from the construction site.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. The work listed in this division is indicative and non-exhaustive. It does not exclude the works described in the other specification sections, shown in the drawings or necessary for the execution of the works in keeping with overall intent of the plans.
2. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
3. Section 01 33 00 - Submittal Procedures.

### **1.2 REFERENCES**

1. American Society for Testing and Materials (ASTM)
  1. ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

### **1.3 SAMPLES**

1. Submit samples in accordance with Section 01 33 00 *Submittal Procedures*.
2. Allow continual sampling by Departmental Representative during production.
3. Provide Departmental Representative with access to source and processed material for sampling.
4. Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling.
5. Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

1. Divert unused aggregate materials from landfill to local site as approved by Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Aggregates for sub-base, base and shoulder in accordance with requirements of NQ-2560-114 Part II: Base, Surface Course and Shoulders.
  1. Type MG 20 granular base materials.
  2. Type MG 112 granular sub-base materials.
  3. Type 1 and type 2 fill materials.
2. Aggregates for pad and coating in accordance with requirements of NQ-2560 Part III: Pad, Coating, Anti-contamination Layer and Filtration Layer.
  1. Type CG-14 granular material for pad and coating.

3. In addition to the geotechnical requirements, the backfill or borrow materials coming from outside the work limits and used inside the work limits must also respect the level A criteria of the "Politique de protection des sols et de réhabilitation des terrains contaminés" by the MDDELCC (the Quebec government authority on environment).

## 2.2 SOURCE QUALITY CONTROL

1. Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
2. If, in opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
3. Notify the Departmental Representative 4 weeks in advance of proposed change of material source.
4. Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## PART 3 - EXECUTION

### 3.1 PREPARATION

1. Handling:
  1. Handle and transport aggregates to avoid segregation, contamination and degradation.
2. Stockpiling:
  1. Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative.
  2. Stockpile aggregates in sufficient quantities to meet Project schedules.
  3. Stockpiling sites to be level, well-drained and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  4. Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  5. Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  6. Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 h of rejection.
  7. Stockpile materials in uniform layers of thickness as follows :
    1. Max 1.5 m for coarse aggregate and granular sub-base materials.
    2. Max 1.5 m for fine aggregate and granular base materials.
    3. Max 1.5 m for other materials.
  8. Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  9. Do not cone piles or spill material over edges of piles.
  10. Do not use conveying stackers.
  11. If Work is performed under winter conditions, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### **3.2 CLEAN UP**

1. Leave aggregate stockpile site in tidy, well-drained condition, free of standing surface water.
2. Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
3. For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.
2. Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **1.2 REFERENCES**

1. American Society for Testing and Materials (ASTM)
  1. ASTM D698-91 (1998), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m).

### **1.3 EXISTING CONDITIONS**

1. Known underground and surface utility lines, as well as other buried structures, are as indicated on the general site plan.
2. Refer to the paragraph about dewatering in Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **1.4 PROTECTION**

1. Protect and/or re-install or re-plant existing fencing, trees, landscaping, natural features, building bench marks, pavement and hard surfaces or underground utility lines that are to remain, as directed by the Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
2. Maintain access roads to avoid the accumulation of construction-related debris on the roads.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Excavated or graded material will be used as filling material on site. Material excavated on the interior and exterior sides of the wall will be reused as backfilling material at the same location.

## **PART 3 - EXECUTION**

### **3.1 GRADING**

1. Rough grade while respecting indicated levels, profiles, and contours and allow for surface treatment as indicated.
2. While rough grading, create slope as instructed.
3. Prior to placing filling material, loosen the soil to a depth of 150 mm. Maintain filling material and existing soil at approximately the same moisture content to facilitate bonding.

4. Compact filled and disturbed areas to the maximum dry density determined in accordance with the ASTM D698 standard, i.e.:
  1. 95% under paved and sidewalk areas.
5. Do not disturb the soil under the branches of the trees or shrubs that are to remain in place.

### **3.2 TESTS**

1. Inspection and testing of soil compaction will be carried out by the Laboratory designated by the Departmental Representative. The expense will be paid by the Departmental Representative.

### **3.3 REMOVAL AND DISPOSAL OF SURPLUS MATERIALS**

1. Remove surplus material and material unsuitable for filling, grading or landscaping off site, as directed by the Departmental Representative.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.

### **1.2 RELATED WORK INCLUDED IN THIS SECTION**

1. This section includes (without being limited to) the following work:
  1. Excavation and backfilling work for all civil engineering structures and landscaping, as well as for a wide areas on the exterior and interior sides of the scarp wall.

### **1.3 REFERENCES**

1. American Society for Testing and Materials International (ASTM).
  1. ASTM C117 04, Standard Test Method for Material Finer than 0,075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  2. ASTM C136 05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  3. ASTM D422 63 2002, Standard Test Method for Particle Size Analysis of Soils.
  4. ASTM D698 00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft) (600 kN m/m).
  5. ASTM D1557 02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft lbf/ft) (2,700 kN m/m).
  6. ASTM D4318 05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
2. Canadian General Standards Board (CGSB)
  1. CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  2. CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
3. Canadian Standards Association, (CSA International)
  1. CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    1. CAN/CSA-A3001-03, Cementitious Materials for Use in Concrete.
  2. CSA-A23.1/A23.2-04, Concrete Materials and Methods of 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.

### **1.4 DEFINITIONS**

1. Excavation classes: Two classes of excavation are recognized; common excavation and rock excavation.
  1. Rock excavation: Solid material in excess of 1.00 m<sup>3</sup> that cannot be removed by means of heavy duty mechanical excavating equipment with a 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material is not classified as rock.

2. Common excavation: Excavation material of any nature that is not included in the definition of rock excavation.
2. Unclassified excavation: Excavation of deposits of any nature encountered during 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 materials larger than 25 millimeters.
4. Waste material: Surplus or excavated material unsuitable for use in Work.
5. Borrow material: Material obtained from locations outside of the area to be graded but required for construction of fill areas or for other portions of Work.
6. Recycled filling material: Material considered inert and obtained from other sources and engineered to meet the requirements of the fill areas.
7. Unshrinkable filling materials: Very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

#### **1.5 SUBMITTALS (DOCUMENTS AND SAMPLES)**

1. Verify and validate the location of underground utilities. Produce a location plan of existing utilities as found in field, including clearance records from the utility authority, as well as a location plan of relocated and abandoned services, as required.
2. Samples
  1. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  2. At least three weeks prior to beginning backfilling Work, inform the Departmental Representative of the proposed source of filling materials and provide access for sampling.

#### **1.6 HEALTH AND SAFETY**

1. Implement necessary construction occupational health and safety measures in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.7 WASTE MANAGEMENT AND DISPOSAL**

1. Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
2. Transport excess aggregate materials that can be reused to a local, authorized site. Obtain necessary permits and authorizations necessary beforehand, and notify the Departmental Representative.

#### **1.8 EXISTING CONDITIONS**

1. Buried services:
  1. Before beginning Work, verify the location of buried services on and adjacent to site.
  2. Arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work. Pay the costs of relocating the services.
  3. Remove and dispose of obsolete buried services and cap cut-offs.

4. Size, depth and location of existing utilities and structures as indicated for informational purposes only. Completeness and accuracy are not guaranteed.
  5. Prior to beginning excavation Work, establish the location and condition of buried utilities and structures, and notify the Departmental Representative of the findings. Provide and apply measures necessary to prevent interruption of service during Work.
  6. Confirm locations of buried utilities through careful test excavations.
  7. Maintain and protect identified water, sewer, gas, electric, telephone and other utilities and structures from damage, as indicated.
  8. Where utility lines or structures exist in area of excavation, obtain appropriate instructions from Departmental Representative before performing work.
  9. Record location of maintained, re-routed and abandoned underground lines, and submit this information to the Departmental Representative.
  10. Confirm locations of recent excavations adjacent to area of excavation.
2. Existing surface features
    1. Conduct, with the Departmental Representative, condition surveys of trees and other plants, lawns, fencing, service poles, wires, pavement, boundary markers and bench marks that could be affected by the Work.
    2. Protect existing buildings and surface features from damage while Work is in progress. In event of damage, repair immediately as directed by the Departmental Representative.
    3. Where required for excavation, cut roots or branches as directed by the Departmental Representative.
3. Unearthed underground elements
    1. If materials such as archaeological remains or any other substance likely to be defined as such are unearthed during excavation, the later must be interrupted to allow appropriate inspection measures. In addition, the Departmental Representative must be informed immediately. Work must not resume until further written instructions is received regarding from the Departmental Representative.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

1. Type 1 and Type 2 filling material: Properties as described in Section 31 05 16 - Aggregate Materials.
2. Type 3 filling material: Selected material from excavation or other sources approved by the Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials. Sieve or filter type 3 material with a comb in order to obtain stones no larger than 75 mm.
3. In addition to geotechnical requirements, backfill materials or borrowed materials used on site must satisfy the generic criterion "A" of the MDDELCC's "Politique sur la protection des sols et la rehabilitation des sols contaminés" (Quebec government authority on the environment's policy on soil protection and the rehabilitation of contaminated sites).
4. Geotextiles: Refer to Section 31 32 19.01 - Geotextiles.

## **PART 3 - EXECUTION**

### **3.1 PREPARATIONS**

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

### **3.2 PREPARATION / PROTECTION**

1. Protect existing features in accordance with 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 the satisfaction of the Departmental Representative.
4. Protect the natural and man-made features that are to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
5. Protect buried services that are to remain undisturbed.
6. Take all necessary precautions prior to excavating to avoid work underpinning structures or works that could affect the stability of the foundations in place.

### **3.3 STOCKPILING**

1. Granular material in accordance with Section 31 05 16 - Aggregate Materials.

### **3.4 DEWATERING AND HEAVE PROTECTION**

1. Keep excavations free of water while Work is in progress.
2. Provide the Departmental Representative with details of proposed dewatering or heave prevention methods, for review.
3. Avoid excavation below groundwater table if soil boiling or heave is likely to occur.
  1. Prevent bottom heave of excavations or piping heave by lowering groundwater, cutting off sheet piles or through other means.
4. Protect open excavations against flooding and damage due to surface run-off.
5. Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
  1. Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

### 3.5 EXCAVATING

1. Notify the Departmental Representative at least seven days in advance of excavation operations so that initial soil cross-sections can be determined.
2. Before beginning excavation Work, the Contractor to present the Departmental Representative with excavation drawings that have been stamped and signed by a geotechnical engineer who is a member of the "Ordre des Ingénieurs du Québec".
3. Excavate to lines, grades, elevations and dimensions as indicated by the Departmental Representative.
4. During excavation, remove structures in accordance with Section 02 41 13 - Selective Site Demolition.
5. Excavation must not interfere with the bearing capacity of adjacent foundations.
6. Do not disturb soil under the branches of trees or shrubs that are to remain.
  1. If excavating through roots, excavate by hand and cut roots with a well sharpened axe or saw.
7. For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench prior to the installation of elements to be buried. In addition, do not leave more than 15 m of open trench at the end of the work day.
8. Keep excavated and stockpiled materials at a safe distance away from the edge of the trench, as directed by the Departmental Representative.
9. Restrict construction machinery operations next to open trenches.
10. Dispose of surplus and unsuitable excavated material at the approved location.
11. Do not obstruct runoff or natural watercourses.
12. Bottom grades must be level and consist of undisturbed soil, and be free of loose, soft or organic matter.
13. Notify the Departmental Representative when the bottom grade is reached.
14. Completed excavation must be approved by the Departmental Representative.
15. Remove unsuitable materials from trench bottom, including those that extend below required elevations to extent and depth as directed by the Departmental Representative.
16. Hand trim the excavation, strengthen the excavation walls 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.
  2. Clean out rock seams and fill with concrete mortar or grout to the satisfaction of the Departmental Representative.
17. Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

### 3.6 FILL TYPE AND COMPACTION

1. Use types of filling material as indicated or specified below. Compaction densities are percentages of maximum densities obtained from the ASTM D698 and ASTM D1557 standards.

1. For backfilling directly at the base and top of the walls, use type 3 material as described in item 2.1.
2. The grain size of the backfilling material and the latter's placement will be confirmed by the control laboratory.

### **3.7 BEDDING AND COVERING OF UNDERGROUND SERVICES**

1. Place and compact granular material for the bedding and covering of underground services as indicated and specified in Section 33 11 16 – Site Water Utility Distribution Piping.
2. Bedding and covering materials must not be frozen when placed.

### **3.8 TRANSITIONS**

1. Make transitions between the undisturbed soil and filling material wherever backfilling was required under a carriage way (parking, driveway, etc.), a roadway or shoulder. In all cases, the excavation walls must be sloped in accordance with the most stringent of the following: CNESST requirements or the transitions specified in this section.
2. When backfilling materials are of the same quality (frost resistance, mechanical property, etc.) that the undisturbed soil of the walls of the excavation (e.g. materials from the excavating), execute transitions realizing slope walls 1H: 1V starting from the infrastructure line to a depth of 2150 mm from the road surface (frozen depth).
3. When the quality (frost resistance, mechanical properties, etc.) of the filling materials and the undisturbed soil of the excavation walls is different, make the following transitions based on the position of the excavation versus the axis of the roadway. In addition, when reusing the material in place where the undisturbed soil of the excavation walls consists of two (2) or more layers of various quality, make the following transitions if the reused materials are not placed in the original order and position:
  1. Where excavation walls are longitudinal in relation to the surface, make transitions with slopes 3H: 1V starting from the infrastructure line up to a depth of 2150 mm from the road surface (soil freezing depth).
  2. Where the excavation walls are transversal in relation with the surface, make transitions with slopes 5H: 1V starting from the infrastructure line up to a depth of 2150 mm from the road surface (soil freezing depth).
4. Where filling material was place around a fixed structure (manhole, catch basin, etc.), make transitions with slopes 3H: 1V starting from the infrastructure line up to a depth of 2150 mm from the road surface (soil freezing depth).

### **3.9 CRUSHED STONE FOR BEDDING**

1. To ensure a stable base when ground conditions are poor and/or where there is water, use clean 20 mm crushed stone and a geotextile membrane for bedding as follows:
  1. If the material of the trench below bed level is rock, cover the surface of the bed with a geotextile membrane.
  2. If the material of the trench below bed level consists of material other than rock, completely cover the base of clean crushed stone with a geotextile membrane.
  3. Spread, level and compact the clean crushed stone by mechanical means in such a way as to avoid settling.

### **3.10 BACKFILLING**

1. Do not proceed with backfilling until:



1. The Departmental Representative has inspected the site and approved installation.
  2. The Departmental Representative has inspected the site and approved the work below the finish grade.
  3. Inspection, testing, approval, and recording of underground utilities.
  4. The removal of shoring equipment and braces and the backfilling of voids with satisfactory soil material.
2. Areas to be backfilled are to be free of debris, snow, ice, water and frozen ground.
  3. The use of backfill material which is frozen or contains ice, snow or debris is prohibited.
  4. Backfilling around structures:
    1. Place bedding and surround material as specified by standard and by the Departmental Representative.
    2. Place layers of filling material simultaneously on both sides of installed structures in order to balance the loads.
  5. Backfill up to the infrastructure line.

### **3.11 RESTORATION**

1. Upon completion of Work, remove waste materials and debris in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by the Departmental Representative.
2. Replace the topsoil as indicated or as directed by the Departmental Representative.
3. Restore lawns to the elevation prior to excavation.
4. Clean and restore the areas affected by the Work as directed by the Departmental Representative.
5. Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SECTION CONTENT**

1. This section lists the requirements for the supply and installation of geotextiles used for the construction of protection structures, filtration, drainage structures, retaining wall structures, and roadbeds, the purpose of which is to:
  1. Separate and prevent the mixing of granular materials of different sizes.
  2. Act as hydraulic filters permitting the passage of water while retaining the strength of granular soil structures.

### **1.2 MEASUREMENT AND PAYMENT**

1. Geotextiles will not be measured for payment. They will be included in pricing for various articles.

### **1.3 RELATED SECTIONS**

1. Section 01 33 00 - Submittal Procedures.
2. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
3. Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **1.4 REFERENCES**

1. American Society for Testing and Materials International, (ASTM)
  1. ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  2. ASTM D4595-86 (2001), Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  3. ASTM D4716-01, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
  4. ASTM D4751-99a, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
2. Canadian General Standards Board (CGSB)
  1. CAN/CGSB-4.2 No. 11.2, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
  2. CAN/CGSB-148.1, Methods of Testing Geosynthetics - (Complete Set).
    1. No.2, Methods of Testing Geosynthetics - Mass per Unit Area.
    2. No.3, Methods of Testing Geosynthetics - Thickness of Geotextiles.
    3. No.6.1, Methods of Testing Geotextiles and Geomembranes – Bursting Strength of Geotextiles Under No Compressive Load.
    4. No.7.3-, Methods of Testing Geotextiles and Geomembranes – Grab Tensile Test for Geotextiles.
    5. No. 10, Methods of Testing Geosynthetics - Geotextiles – Filtration Opening Size.

3. International Canadian Standards Association (CSA International)
  1. CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  2. CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

## **1.5 SUBMITTALS**

1. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
2. Submit to Departmental Representative the following samples at least three weeks prior to beginning Work.
  1. Minimum length of 2 m of roll width of geotextile.

## **1.6 DELIVERY, STORAGE AND HANDLING**

1. During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dust, debris and rodents.

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

1. Remove all packaging materials from the site and dispose of them at appropriate recycling facilities.

# **PART 2 - PRODUCTS**

## **2.1 MATERIALS**

1. Membrane of non-woven, needle punched synthetic fibers consisting of polypropylene or polyester. The geotextile must be rot-proof, insensitive to the action of acids and bases and unalterable by micro-organisms and insects.
2. Each roll must be identified and display, among others, the manufacturer's name, the type of membrane and its size, surface mass and mechanical properties.
3. The sewing thread is made of polyester, gauge 250 dtex.
4. For a section of the perforated drain at the North end of the right face foundation, encase clean stone with non-woven geotextile membrane coated with resin containing copper hydroxide for preventing the formation of roots through membrane.

# **PART 3 - EXECUTION**

## **3.1 PLACEMENT**

1. Unroll the aligned geotextile on a level surface in the manner and location indicated.
2. Place the geotextile material so that the surface is smooth and free of tension stress, folds, wrinkles and creases.
3. Place geotextile material on sloping surfaces in continuous lengths from the toe of the slope to the upper extent of the geotextile.

4. Overlap each successive strip of geotextile 600 mm over the previously laid strip.
5. Protect installed geotextile material from displacement, damage or deterioration before, during and after the placement of material layers.
6. Replace damaged or deteriorated geotextile at the satisfaction of the Departmental Representative.
7. Do not backfill until the Departmental Representative has approved of the geotextile.

### **3.2 CLEAN UP**

1. Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

### **3.3 PROTECTION**

1. Vehicular traffic directly on geotextiles is not permitted.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

1. The list of work sections in this division is indicative and non-exhaustive. It does not exclude the works described in the other specification sections, shown in the drawings or necessary for the execution of the works in keeping with overall intent of the plans.
2. Section 01 33 00 – Submittal Procedures.
3. Section 01 45 00 – Quality Control.
4. Section 01 74 11 – Cleaning.
5. Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

### **1.2 SCOPE OF WORK**

1. Provide all material, equipment and labour required to fabricate and install the soil anchors required on all of the plans and/or required for the complete and correct execution of the work.
2. Realise the borings.
3. Provide and put in place the anchors and their accessories.
4. Provide and inject the grout using the pressure grouting method.
5. Tensioning of the bars.
6. All other work required to complete the works as shown on drawings.

### **1.3 GEOTECHNICAL REPORT**

1. Geotechnical studies on the construction area are not available.
2. The Contractor will plan the drilling of boreholes in order to determine the type of soil. This will allow him to estimate the injection pressure for pressure grouting.

### **1.4 SHOP DRAWING**

1. Submit shop drawings in compliance with section 01 33 00.
2. Drawings shall indicate bar diameter, steel grade, plates and nuts description, etc.
3. Submit the grout mix formula and all admixtures.

### **1.5 MILL TESTS**

1. Submit, on request from the Departmental Representative, a copy of the mill tests including physical and chemical composition of the provided steel, at least two (2) weeks before the start of the work.

## **PART 2 - PRODUCTS**

### **2.1 MATERIAL**

1. Anchors
  1. High strength steel bar threaded all along hot dip galvanised of grade  $F_u = 1030$  MPa.
  2. Diameters are shown on plans.
2. Bearing plates
  1. Stainless steel plates supported against non-shrinkable grout between the plate and the masonry backing.
3. Nuts and accessories
  1. According to manufacturer specifications.
4. Grout
  1. Expansive Portland cement grout of 50 MPa strength at 28 days and 30MPa strength at tensioning.
5. Galvanisation
  1. Submit to the Departmental Representative the galvanisation procedure for high strength bars.
6. Testing
  1. Do the anchor tensioning with an hydraulic jack approved by the Departmental Representative.

## **PART 3 - EXECUTION OF THE WORK**

### **3.1 EXECUTION**

1. Execution
  1. Installation and tensioning of the rock anchors shall comply to the specs and to the manufacturer recommendations. Before the start of the work, the contractor shall submit a document presenting his installation and injection procedure to the Departmental Representative. Also, this procedure shall indicate all equipment to be used at each step. The contractor remain however entirely responsible of his boring and grouting technics.

### **3.2 BORING**

1. Drill 150 mm diameter holes in the ground. The drilling depth indicated in the plans is the minimum depth desired. The Contractor will determine the exact depth of the part without a sleeve based on the injection pressure used at the construction site.
2. Inclination tolerance of borings is 1 degree.

### **3.3 ANCHOR INSTALLATION**

1. Cover with a high content of zinc product the local damage to galvanisation when those damage are below 1 % of the total area.
2. The hydraulic jack shall be calibrated and equipped with a control system to prevent over loading. The tensioning operation shall be done in the presence of a Departmental Representative.

### **3.4 GROUTING**

1. Grout injection will be carried out under a pressure of at least 1 MPa. The exact injection pressure will be determined on site by the Contractor based on the type of soil, the injection equipment and the length of the hollow bars without sleeves.
2. The Contractor will use the first soil anchor as test anchor and will determine the injection pressure and anchor length without the sleeve.
3. The contractor will make sure that the injected grout has completely filled the space around the bar from the bearing plate to the end of the boring and that all the air has been evacuated.

### **3.5 ANCHOR AND TENSION TESTS**

1. All soil anchor must be permanently preload at a value of 100kN.
2. For each horizontal row of soil anchor (refer to the elevation on the plan), five (5) soil anchors will be tested at 330 kN. The test load will be reached in 4 stages (82.5kN, 165kN, 247.5kN and 330kN). There will be a one (1) minute interval between each stage. When the last stage will be reached, deformation and pressure measurements will be made after periods of time of 1, 2, 3, 4, 5, 6 and 10 minutes. The test will be considered valid when the pressure in the actuator will remain unchanged and that deformation will not exceed 1 mm between the 1-minute and 10-minute marks.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

1. Section Includes:
  1. Materials and installation for preserving plants affected by changing grades or excavation and by masonry work on walls.

### **1.2 RELATED REQUIREMENTS**

1. The list of Work in this division is indicative but non-limiting. It does not exclude Work described in other specification divisions shown on the drawings or required for full execution of the Work as intended on the drawings.
2. Section 32 91 19.13 – Topsoil Placement and Grading.
3. Grading, excavation: see engineering sections.

### **1.3 REFERENCES**

1. Department of Justice Canada (Jus).
  1. Canadian Environmental Protection Act, 1999, ch. 33.
  2. Fertilizers Act (R.S. 1985, c. F-10).
  3. Fertilizers Regulations (C.R.C., c. 666).
  4. Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
2. Health Canada - Pest Management Regulatory Agency (PMRA).
  1. National Standard for Pesticide Education, Training and Certification in Canada (1995).
3. Good practice standards of the Société internationale d'arboriculture Québec (SIAQ).

### **1.4 QUALITY ASSURANCE**

1. Take necessary construction occupational health and safety measures.
2. The Contractor must be a commercial member in good standing of the SIAQ (Société internationale d'arboriculture Québec).

### **1.5 SCHEDULING**

1. Obtain approval from Departmental Representative of schedule indicating beginning of Work.

### **1.6 IDENTIFICATION**

1. The Contractor and Departmental Representative must identify the plantings on site to be preserved and protected. The Contractor must apply measures in accordance with the Departmental Representative's instructions.



## **1.7 PROTECTION**

1. Do not damage plantings, site features, markers, existing buildings, public utility services that must remain in place. Repair damage.
2. The following is not allowed without written consent from the Departmental Representative.
  1. Removal, pulverization, fertilization, pruning, above or below ground, disturbance or modification of trees.
  2. Objects or materials interfering with supply of water, air or nutrients to root systems.
  3. Marking, puncture or removal of tree bark, including any action likely to damage the tree bark.
  4. Attaching objects to trees.
  5. Attaching devices to protect or support.
  6. Exposing trees to toxic or hazardous substances in gas, liquid or solid form.
  7. Exposing trees to heat from fire or other source.
  8. Changing slopes and drainage, creating obstacles to water, air and nutrient supply to trees.
  9. Attaching materials to trees and leaning materials on trees while executing work in their vicinity.
  10. Removing or displacing tree protection.
  11. Interfering with openings in tree protection, creating obstacles to water, air and nutrient supply to trees.
  12. Excavating, disturbing or compacting soil inside drip line of trees.
  13. Depositing construction, excavation materials and debris inside drip line.
  14. Digging ditches, tunnels or trenches, building or covering walkways inside drip line, or at a distance from a tree's trunk equal to 10 times its diameter, measured at 1.40 metres from the ground with a minimal distance of 100 cm.
3. Meet with Departmental Representative prior to carrying out work near trees to avoid items listed in 1.3.2. A procedure will be provided at the meeting specifying the work methods to be used near the trees and protective measures.
4. The procedure will be issued before and during the contract's execution and will be automatically integrated into the contract with no additional financial compensation.

## **PART 2 - PRODUCT**

### **2.1 MATERIALS**

1. Materials
  1. High density polyethylene fencing, 1,200 mm high, orange.
  2. Steel T stake, 2,500 mm.
  3. Wood to protect tree trunks: softwood (spruce, pine or balsam), utility grade, 38 x 65 x 1,830 mm.
  4. Metal straps as needed and approved by Departmental Representative.
  5. White geotextile.
  6. Steel rod or stake, 600 mm.
  7. Soil: refer to specifications under Section 32 91 19.13 – Topsoil Placement and Grading.

2. Peatmoss:
  1. Derived from partially decomposed species of Sphagnum Mosses.
  2. Elastic and homogeneous.
  3. Free of wood and deleterious material which could prohibit growth.
  4. Shredded minimum particle size: 5 mm.
3. Fertilizer:
  1. To Canada Fertilizer Act and Fertilizers Regulations.
  2. Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.
4. Anti-desiccant: commercial, wax-like emulsion.
5. Filter Cloth:
  1. Type 1: 100% non-woven needle punched polyester, 2.75 mm thick, 240 g/m<sup>2</sup> mass.
  2. Type 2: biodegradable burlap.
6. Welded wire fabric (WWF): 100 x 100mm, to CSA G30.5.
7. Wood posts: 38 x 89 x 2 400 mm length.
8. Fill:
  1. Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
  2. Type (B): excavated, pervious soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Departmental Representative before use as fill.
9. Coarse washed stones: 35-75 mm diameter clean round hard stone.

## **PART 3 - EXECUTION**

### **3.1 IDENTIFICATION AND PROTECTION**

1. Take necessary construction occupational health and safety measures.
2. Identify with Departmental Representative plantings to be preserved and protected. Apply measures as indicated by Departmental Representative.
3. Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.
4. Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.
5. Departmental Representative must inspect Contractor's protective measures prior to beginning work. If necessary the Departmental Representative will request to have branches over work zone trimmed by specialized personnel. Trimming must be supervised based on guidelines provided to the workers.
6. The Contractor will be penalized if trees to be preserved are damaged. A sum of money has been determined for each injury to the trees, as indicated below:

1. Surface of injury ranging between 0 and 100 cm<sup>2</sup> 75,00 \$
2. Surface of injury ranging between 100 and 200 cm<sup>2</sup> 150,00 \$
3. Surface of injury larger than 200 cm<sup>2</sup> 300,00 \$
7. If an injury is larger than 50% of the total circumference of the tree trunk, the Departmental Representative will consider the tree a total loss and compensation will be established by the Departmental Representative's specialist based on the basic value of the tree.
8. Protective measures must be applied during the construction period for work exceeding two days.
9. Contractor must install construction fence 1.2 metres high and 3 metres minimum distance from trunk, wooded area, tree or trees and shrubs to be preserved, as indicated by Departmental Representative. Fencing may also be located outside drip line, as specified by Consultant. Fencing (high density polyethylene 35 KN) must be attached to steel stakes spaced every two metres.
10. Where fencing cannot be installed, trees identified by the supervisor with 1.8 metre planks around the trunks. Secure planks with plastic or steel straps cushioned with rubber such as tire rubber.
11. If trees are damaged during work, the Contractor shall take full responsibility including financial compensation for the loss of value of the damaged trees based on the method used by the Société internationale d'arboriculture – Québec inc. (resolution CE-86-1682). Repairs are at the Contractor's expenses. The Departmental Representative shall determine the cost without recourse.
12. Remove tree and shrub roots exposed or damaged by excavation or removal of existing structures by specialized personnel and as indicated by Departmental Representative. Use clean cuts or tree surgery.

### **3.2 PROTECTIVE FENCING**

1. Use fence to identify tree protection zone. Mobile fencing is allowed inside work zone provided root systems are protected inside drip line.
2. Orange plastic snow fence, approximately 1,200 mm high supported by steel stakes. Maintain throughout work.

### **3.3 TRUNK PROTECTION**

1. Prior to work carried out near trees and as indicated by Departmental Representative, protect tree trunks from ground level to tree limbs using planks installed around trunk and secured with metal straps.

### **3.4 SOIL COMPACTION PREVENTION**

1. All of the trees located near the excavation area will be protected, whenever possible, with fences around the perimeter of the tree root protection zone (the circumference of the tree crown projected to the ground). In the traffic areas within the tree root protection zone, the Contractor will place a 300 mm thick layer of material that will not compact the soil, e.g. wood chips, steel sheets, crushed stone or a combination of the two, on top of a geotextile membrane pervious to air and water, in accordance with the recommendations of the CCBN' representative.

### **3.5 ROOT CURTAIN SYSTEM**

1. Identify limits for required construction excavation as approved by Departmental Representative. Notify the latter at least 48 hours in advance in order to ensure the attendance of the CCBN arborist.
2. Prior to construction excavation, 300 mm wide x 600 mm deep, along perimeter of excavation limits.

3. Contractor will prune exposed roots cleanly at side of trench nearest plants to be preserved according to the recommendations of the CCBN arborist.
4. Install wooden posts and welded wire fabric against construction edge of trench.
5. Securely attach Type 2 filter fabric on plant side of wire mesh.
6. Prepare homogeneous mixture of fertilizer, parent material and organic matter.
  1. Add organic matter to mixture to achieve 7-9% organic matter content by weight.
  2. Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5]kg/m<sup>3</sup>.
7. Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.
8. Protect root curtain from damage during construction operations.
9. Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
10. Protect root curtain before and during backfill operations.

### **3.6 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES**

1. Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Notify the Departmental Representative at least 48 hours in advance in order to ensure the attendance of the CCBN arborist.
2. Excavate manually within zone of root system. Contractor will prune the roots in accordance with the excavation work according to the recommendations of the CCBN arborist. At no time will the Contractor sever roots himself during construction without presence of CCBN arborist.
3. Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.
4. Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

### **3.7 LOWERING GRADE AROUND EXISTING TREES**

1. Begin Work in accordance with schedule approved by Departmental Representative.
2. Cut slope not less than 500 mm from tree trunk to new grade level or retaining wall.
3. Excavate to depths as indicated. Protect from damage root zone which is to remain.
4. Contractor will prune the roots in accordance with the recommendation of the CCBN arborist.
5. Prepare homogeneous soil mixture consisting by volume of:
  1. 60% excavated soil cleaned of roots, plant matter, stones, debris.
  2. 25% coarse, clean sterile sand.
  3. 15% organic matter.
  4. Grade 2:12:8 fertilizer at rate of 1.5 kg/m<sup>3</sup>.
6. Place soil mixture over area of excavation to finished grade level. Compact to 85%
7. Water entire root zone to optimum soil moisture level.

8. Install surface cover of sodding in accordance with Section 32 92 23 - Sodding.

### **3.8 PRUNING**

1. If applicable, the Contractor will identify the branches located in areas where operating machinery may damage them. Pruning will be carried out solely by the CCBN with the Contractor in attendance prior to the latter's mobilization efforts. The Contractor will not permit pruning at the construction site. If additional pruning is required during construction, the Contractor will submit a written request to the Departmental Representative so that the latter may coordinate the work with the CCBN, which will carry out the additional pruning at the Contractor's expense.

### **3.9 WATERING**

1. Water root system to prevent soil from drying along excavated areas.
2. Water root systems of trees as indicated by supervisor if weather conditions dry soil too quickly.
3. Water inside drip line minimum 15 cm deep, in stages until water has penetrated soil, to minimize run-off.
4. Water root systems two times per week during construction period or excavation when roots systems have been exposed. Water each tree 250 litres. The type of watering may be modified during construction based on site conditions.
5. The Contractor will water during the entire construction period.

### **3.10 ROOT PROTECTION**

1. Prior to construction, the Contractor will submit a tree root protection plan to the Departmental Representative, for approval. The plan will be produced by an arborist hired by the Contractor.

### **3.11 FERTILISATION**

1. For the entire construction period, the CCBN arborist will visit the site in order to fertilize the trees. The Contractor will provide him with the necessary access.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.
2. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
3. Section 31 05 16 - Aggregate Materials.

### **1.2 REFERENCES**

1. American Society for Testing and Materials (ASTM)
  1. ASTM C117 95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  2. ASTM C131 96, Standard Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  3. ASTM C136 96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  4. ASTM D422 63(1998), Standard Test Method for Particle Size Analysis of Soils.
  5. ASTM D698-00a, 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>).
  6. ASTM D1557 00, Test Method 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>).
  7. ASTM D1883 99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  8. ASTM D4318 00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
2. Canadian General Standards Board (CGSB)
  1. CAN/CGSB-8.188, Sieves, Testing, Woven Wire, Inch Series.
  2. CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

1. Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
2. Transport the excess aggregate materials that can be reused to a local, authorized site. Obtain necessary permits and authorizations necessary beforehand, and notify the Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Granular sub-base material: MG 112 and in accordance with requirements of Section 31 05 16 - Aggregate Materials. Thickness of materials placed will be in accordance with the value indicated on the drawings.

2. Granular base material: MG 20 and in accordance with the requirements of Section 31 05 16 - Aggregate Materials. Thickness of materials placed will be in accordance with the value indicated on the drawings.
3. The materials of the granular coating layer (stone dust) must be 2.5 - 5.0 mm and comply with the requirements of Section 31 05 16 - Aggregate Materials. The thickness of the materials will be in accordance with the value indicated on the drawings.

## PART 3 - EXECUTION

### 3.1 FINAL PROFILE AND VERIFICATIONS

1. The profile and geometry indicated on the plans are indicated for information purposes only. The profile and the final geometry will be determined on site, after implementation, in collaboration with the Contractor and the Departmental Representative, taking drainage and existing facilities into account.
2. The implementation of alignments and levels must be subjected to the following procedure:
  1. Install alignments stakes, levels and benchmarks for sidewalks or curbs every 10 meters maximum, at the low and high points of the vertical layout, where trajectory changes and at the manholes that must remain in place, based on the profiles indicated on the plans.
  2. Conduct a joint audit with the Departmental Representative to optimize the profile of the finished ground, so as to adapt to existing conditions, taking into account the existing buildings, the proper drainage of accesses and parking lots and the existing manholes that must remain in place.
  3. With the Departmental Representative, create a new list of elevations, if applicable.
  4. Change or correct the alignments, levels and bench marks, if applicable, taking the new list of elevations into account.
3. When verifying the proposed levels of each sub-base layer and infrastructure, the supervisor will follow the following procedure:
  1. Access roads measured based on chainage: Implement levels and bench marks at the center line and at the two (2) ends of the road, every ten (10) meters maximum (just chaining; 0+010, 0+020, etc.), at the low and high points of the vertical layout, where trajectory changes and at the manholes that must remain in place, based on the profiles indicated on the plans.
  2. Linear elements without chainage: implement levels and bench marks at every 10 meters of sidewalk or curb maximum, at the low and high points of the vertical layout, where trajectory changes, where elevation is indicated on the plans, at the existing or projected manholes, based on the profiles and superelevations indicated on the plans. At the request of the supervisor, gird large road surfaces every 10 meters.
  3. Allow a reasonable amount of time for Departmental Representative to carry out audits prior to the placement of the next layer of material.

### 3.2 PLACEMENT

1. Place granular sub-base after the inspection and approval of the subgrade by the Departmental Representative.
2. Construct the granular sub-base, the granular base and granular pavement lining where indicated and in accordance with specified depths and grades.
3. Ensure that no frozen material is placed.
4. Place material only on clean unfrozen surface, free from snow or ice.

5. Place the granular sub-base, granular base and granular pavement lining using methods which do not lead to segregation or degradation.
6. Place material in even layers to the full width of the work.
7. Shape each layer of material to create an even profile and then compact to the specified density before the next layer is placed.
8. Remove and replace any portion of layer where material has become segregated during placement.

### **3.3 COMPACTION**

1. The compaction equipment must be able to achieve the required material densities.
2. The efficiency of compaction equipment other than that which is listed in these specifications must prove to be at least as efficient as the equipment specified and at no extra cost. In addition, written approval from the Departmental Representative must be received before the equipment is used.
3. Compaction equipment will be equipped with a meter that will record the hours of actual compaction work, not the amount of time that the motor has been running.
4. Compact MG 112 granular sub-base to the minimum threshold of 95% of the reference density, as determined by modified Proctor testing in accordance with the CAN/BNQ 2501-255 standard.
5. Compact MG 20 granular base to the minimum threshold of 98% of the reference density, as determined by modified Proctor testing in accordance with the CAN/BNQ 2501-255 standard.
6. Shape and roll alternately to obtain smooth, even and uniformly compacted granular base.
7. Apply water as necessary during compaction to obtain specified density.
8. In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
9. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
10. Unless otherwise specified, the Contractor will use static compaction methods at all times. He will also obtain the approval of the Departmental Representative prior to using dynamic compaction methods.

### **3.4 SITE TOLERANCES**

1. The finished granular base surface is to be within 10 mm of the specified elevation. However, this 10 mm will not be consistent over the entire surface of the granular base.

### **3.5 PROTECTION**

1. Maintain the finished granular base in a condition that complies with the provisions of this section until the next layer is constructed or until the granular base is accepted by the Departmental Representative.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.

### **1.2 REFERENCES**

1. Canadian General Standards Board (CGSB)
  1. CAN/CGSB-15.1-92, Calcium Chloride.
2. U.S. Environmental Protection Agency (EPA)/Office of Water
  1. EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.3 SUBMITTALS**

1. Submit submittals and data sheets in accordance with Section 01 33 00 – Submittal Procedures.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Water: Subject to the Departmental Representative's approval.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION**

1. Apply water using approved equipment when directed by the Departmental Representative.
2. Apply water with a sprayer system equipped with a shut-off device in order to ensure an even uniform application.
3. Contractor shall consider that the site of work requires special consideration in respect of high standards of dust control due to the tourist use of the site.

### **3.2 CLEAN UP**

1. Cleaning during construction: clean in accordance with Section 01 74 11 - Cleaning.
  1. Clean the work area at end of each day.
2. Final cleaning: upon completion of the work, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.
2. Section 01 33 00 - Submittal Procedures.
3. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
4. Section 32 92 23 – Sodding.

### **1.2 REFERENCES**

1. Agriculture et Agroalimentaire
  1. The Canadian System of Soil Classification, Third Edition, 1998.
2. Canadian Council of Ministers of the Environment (CCME)
  1. PN1340 (2005), Guidelines for Compost Quality.
3. NQ 0605-100 standard "Aménagement paysager à l'aide de végétaux" (landscaping with plants).
4. NQ 2501-025 standard, modified for mixed soils (organic and inorganic).
5. U.S. Environmental Protection Agency (EPA)/Office of Water
  1. EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.3 DEFINITIONS**

1. Compost
  1. Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
  2. Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss on Ignition (LOI) test.
  3. Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 25), and contain no toxic or growth inhibiting contaminants.
  4. Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

### **1.4 SUBMITTALS**

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

### **1.5 QUALITY ASSURANCE**

1. Pre-placement meeting: A pre-placement meeting is to be held one week prior to the beginning of the work covered by this section for the purpose of reviewing project requirements, placement instructions and the terms of the warranty.

## 1.6 WASTE MANAGEMENT AND DISPOSAL

1. Separate waste materials for reuse in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.
2. Transport unused soil amendments to an official hazardous material collection site approved by the Departmental Representative.
3. Do not dispose of unused soil amendments into sewer systems, lakes or streams, on the ground or in locations where they will pose health or environmental hazards.

## PART 2 - PRODUCTS

### 2.1 TOPSOIL

1. Topsoil for sodded areas, flower beds/planting areas: Mix consisting of particles, micro-organisms and organic matter forming an environment favorable for the growth of the desired plants.
  1. Will not contain toxic elements or growth inhibitors.
  2. Will produce a finished surface free of the following:
    1. Debris and stones with a diameter greater than 50 mm.
    2. Coarse vegetal matter with a diameter greater than 10 mm and more than 100 mm long, and higher in content than 2% of the soil volume.
  3. Consistency: loose when moist.
    1. Mix #1 (for sodding).
      1. Composition:
        1. 45% compost, sand, arable soil, peat soil.
        2. 55% recycled content.
      2. Mix #2 (for planting):
        1. Composition:
          1. 55% compost, organic fertilizer, sand, arable soil, peat soil.
          2. 45% recycled content.
    4. Mix characteristics.
      1. Generally speaking, the mixes will be as follows:
        1. Free of pesticide residues.
        2. Consistent and homogeneous.
        3. Will not contain any object larger than two (2) centimeters in diameter.
      2. Mix #1 (for sodding): The mix will be as follows:
        1. Organic matter content ranging between 4% and 8% (dry base).
        2. Water content pH ranging between 6 and 7.
        3. Cation exchange capacity higher than a range between 10 and 20 meq/100 g of soil.
        4. Settlement and compaction: 25%.
        5. Apparent density (moist, unsettled 100 kg/m³.
        6. P (phosphorous) 80 Ppm.

7. K (potassium) 156 Ppm.
    8. Mg (magnesium) 45 Ppm.
  3. Mix #2 (for planting): the mix will be as follows:
    1. Organic matter content ranging between 8% and 12% (dry base).
    2. Water content pH between 6 and 7.
    3. Cationic exchange capacity ranging between 10 and 20 meq/100 g of soil.
    4. Settlement and compaction: 30%.
    5. Apparent density (moist, unsettled 800 kg/m<sup>3</sup>).
    6. P (phosphorous) 200 Ppm.
    7. K (potassium) 200 Ppm.
    8. Mg (magnesium) 67 Ppm.
2. Grain size requirements:
  1. The sieved topsoil mix will respect the sieve sizes in accordance with the BNQ-2501-025 standard, modified for mixed soils (organic and inorganic).
3. Topsoil analyses
  1. Provide an analysis certificate signed by a chemist, which will include the organic matter content, the water content's pH, the content in P, K, Mg and, Ca, as well as the result of a grain size analysis, if requested, at least 30 days prior to the beginning of the work.
  2. Amend the soil if it does not meet the requirements of these specifications.
  3. Inspect the topsoil samples in accordance with the procedures included in the document entitled *Méthodes d'analyse des sols, des fumiers et des tissus végétaux – Agdex 533*, of the "Conseil des productions végétales du Québec":
    1. *PR-1: Préparation des échantillons* (sample preparation).
    2. *PH-1: pH à l'eau* (water pH).
    3. *PH-2: pH tampon* (buffer pH).
    4. *MA-1: matière organique (inférieure à 20 %)* (organic matter content lower than 20%).
    5. *MA-2: matière organique (supérieure à 20 %)* (organic matter content higher than 20%).

## 2.2 SOIL AMENDMENTS

1. Fertilizer:
  1. Fertility: main soil nutrients will be present in the following amounts.
  2. Nitrogen (N): 20 to 40 micrograms of available nitrogen 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. Peat moss:
  1. Consisting of partially decomposed varieties of sphagnum moss.
  2. Elastic and homogeneous, brown in colour.
  3. Free of wood and deleterious material which could prohibit growth.

4. Minimum size of shredded particles: 5 mm.
3. Sand: washed coarse silica sand, medium to coarse texture.
4. Organic matter: Category A compost in accordance with the CCME's PN1340 document, unprocessed organic matter, such as manure muck, hay, straw, bark residues or sawdust, meeting organic matter, stability and contaminant requirements.
5. Category B compost will be used to return dump sites or large scale industrial applications to original conditions.
6. Lime:
  1. Ground agricultural lime.
  2. Grade requirements: 90% percentage passing by weight through 1.0 mm sieve, 50% passing through 0.125 mm sieve.
7. Fertilizer: standard industry-accepted medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable for specific plant species or applications or defined by soil tests.

## 2.3 SOURCE QUALITY CONTROL

1. Inform the Departmental Representative of the sources of topsoil to be utilized and give sufficient advance notice for testing.
2. The Contractor is responsible for the assessment of soil amendment needs in order to provide topsoil as specified.
3. Soil testing for pH, P, K and organic matter will be performed by an accredited laboratory.
4. Topsoil tests will be carried out by the laboratory selected by the Departmental Representative.

## PART 3 - EXECUTION

### 3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

1. Implement temporary erosion and sediment control measures in order to prevent soil erosion caused by runoff or wind, as well as the accumulation of sediments from runoff or airborne dust on adjacent properties and walkways, this in accordance with the requirements of the authorities having jurisdiction.
2. Inspect, repair, and maintain erosion and sediment control measures during construction until permanent vegetation is been established.
3. Remove erosion and sediment controls when appropriate and restore and stabilize the areas disturbed during construction.

### 3.2 STRIPPING OF TOPSOIL

1. Begin stripping the topsoil in the areas identified by the Departmental Representative after the area has been cleared and the brush, weeds and grasses have been removed from the site.
2. Strip topsoil to indicated depths.
  1. Avoid mixing topsoil with the subsoil if there is a chance that the resulting topsoil texture topsoil will become unacceptable *versus* the established parameters and intended use.

3. Stockpile in locations as directed by the Departmental Representative.
  1. Stockpile height will not to exceed 2 m.
4. Dispose of unused topsoil in an environmentally responsible manner but not in at a landfill site, as directed by the Departmental Representative.
5. Protect stockpiles from contamination and compaction.

### **3.3 PREPARATION OF EXISTING GRADE**

1. Verify that the grade is correct.
  1. Should discrepancies occur, notify the Departmental Representative and do not commence work until instructed by the Departmental Representative.
2. Grade the soil to eliminate uneven areas and depressions in order to ensure adequate drainage.
3. Remove debris, roots, branches, and stones in excess with diameters larger than 50 mm, as well as other deleterious materials.
  1. Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
  2. Remove debris protruding more than 75 mm above the surface.
  3. Dispose of removed material off site.
4. Loosen the soil in the entire area where topsoil is to be placed, to minimum depth of 100 mm.
  1. Loosen the soil again transversally where equipment used for hauling and spreading has compacted the soil.

### **3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

1. Place topsoil only after the Departmental Representative has accepted the subgrade.
2. Spread the topsoil in even layers not exceeding 150 mm in thickness.
3. For sodded areas, keep the topsoil 15 mm below the finished grade.
4. Spread the topsoil as indicated below to obtain the following minimum depths after settlement:
  1. 100 mm for seeded areas.
  2. 100 mm for sodded areas.
  3. 300 mm for flower beds.
  4. 500 mm for shrub beds.
5. Manually spread the topsoil/planting soil around trees, shrubs and obstacles.
6. In planting pits, spread the topsoil in consecutive layers 300 mm thick and compact each layer of topsoil in order to allow the plantation of trees or shrubs, as the case may be, in soil that will not subside. The compaction method will be approved by the Departmental Representative beforehand. The soil will be compacted at 90% modified Proctor.

### **3.5 FINISH GRADING**

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

2. Consolidate topsoil to required bulk density using equipment approved by the Departmental Representative.
  1. Leave surfaces smooth, even and sufficiently firm to keep foot prints from forming.

### **3.6 SOIL AMENDMENT**

1. Apply soil amendment products and mix throughout the specified topsoil thickness.

### **3.7 ACCEPTANCE**

1. The Departmental Representative will inspect and test the topsoil in place and determine the acceptance of the material, the depth and grade finish.

### **3.8 SURPLUS MATERIAL**

1. Dispose of surplus materials, with the exception of topsoil, off site.

### **3.9 CLEANING**

1. Proceed in accordance with Section 01 74 11 - Cleaning.
2. Upon completion of the work, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.
2. Section 01 33 00 - Submittal Procedures.
3. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
4. Section 32 91 19.13 - Topsoil Placement and Grading.

### **1.2 SUBMITTALS**

1. Submit samples in accordance with section 01 33 00 - Submittal Procedures.

### **1.3 QUALITY ASSURANCE**

1. Test Reports: submit certified test reports showing that products, materials and equipment comply with specified performance characteristics and physical properties.
2. Certificates: submit certificates signed by the manufacturer attesting that products, materials and equipment comply with specified performance characteristics and physical properties.
3. Pre-installation meeting: A pre-installation meeting will be held one week prior to the start of the work covered by this section in order to review project requirements, installation instructions and warranty requirements.

### **1.4 TRANSPORTATION, STORAGE AND HANDLING**

1. Delivery and acceptance: Deliver the material at the construction site in their original packaging, which will display a sticker indicating the name and address of the manufacturer.
2. The Contractor will provide a delivery schedule in order to reduce the amount of time required for storage at the construction site, without causing delays regarding the execution of the work.
3. The sod will be rolled and place in such a way as to avoid damages during transportation and handling.
4. The sod will be transported, unloaded and stored only on pallets.
5. The sod will be delivered within 24 hours of harvesting and installed within thirty-six (36) hours of harvesting.
6. Delivering sod that is too small, asymmetrical or damaged is prohibited.
7. In wet weather, the sod will be sufficiently dried so that they will not break when collecting or handling them.
8. In dry weather, protect the sod so that it will not dry completely. They will be watered enough to ensure that it in order to maintain vitality and keep the soil from detaching during handling. Dry sod will not be accepted.



9. The sod will be installed as soon as delivered. Should there be a delay between delivery and placement, the sod will be kept moist and cool until final placement.
10. The fertilizer will be delivered and stored in airtight bags, on which the weight, content and maker will be indicated.
11. Protect the sod against heat, dehydration or frost, from harvest to placement.
12. The sod will be harvested when the ground will not be too dry and when the temperature will be above 0 degrees C.

## **1.5 SCHEDULE OF WORK**

1. Establish timing of sod placement to coincide with surface preparation.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

1. Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
2. Transport unused fertilizer from to an official hazardous material collection site approved by the Departmental Representative.
3. Do not dispose of unused fertilizer in sewer systems, lakes, and streams, on the ground or in locations where it will pose health or environmental hazards.

# **PART 2 - PRODUCTS**

## **2.1 MATERIALS**

1. Cultivated sod #1: Turf grass specially sown and cultivated in a sod farm or dedicated fields.
  1. Type of grown sod
    1. Kentucky Bluegrass #1: grown solely from Kentucky Bluegrass cultivar seeds and containing at least 50% of Kentucky Bluegrass cultivar.
    2. Grade 1 named cultivar: grown from certified seeds.
  2. Cultivated turf quality
    1. 1500 mm high turf dense enough to hide the soil after mowing to a height of 50 mm.
    2. Maximum mowing height: Between 35 and 65 mm.
    3. Thickness of the sod's soil: Between 6 and 15 mm.
2. The sod will consist of certified first grade turf grown in Quebec on mineral soil, preferably near the construction site, in accordance with the NQ 0640-050 standard "Gazon en plaques classification et caractéristiques" (sod – classifications and characteristics), and consisting of a mix of seeds corresponding to the use and location where it will grow.
3. The sod will be grown and sold in accordance with all applicable quality standards. The sod's roots will be strong and fibrous, free of stones, disease, weeds and deficiencies.
4. Water
  1. The Contractor will supply his own water from a tank.
  2. The water will be free of impurities and mineral salts that could hinder plant growth.

5. Fertilizer
  1. Fertilizer in accordance with the Fertilizers Act and to Fertilizers Regulations Canada.
  2. Slow-release synthetic granular fertilizer, containing no more than 35% of soluble nitrogen or preferably biological, organic fertilizer.
  3. 8-30-12 formula containing 8% nitrogen from two sources, of which one is ammonium sulfate, 30% phosphorous, simple superphosphate and ammoniacal phosphorous, 12% potassium, part of which will take the form of sulfate, magnesium, sulfur and minor elements.
  4. Formulas and fertilizer types proposed by the Contractor, recommended by the laboratory based on the season. The formulas will be included in a plantation and maintenance plan to be validated by the Departmental Representative.
6. Topsoil for sodding
  1. The topsoil for sodding will be in accordance with the requirements of the section entitled "Placement of top soil and finish grading".

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

1. Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If deviations occur, notify the Departmental Representative and do not commence work until instructed by the Departmental Representative.
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 the surface so that it is even, free of depressions and soil asperities, as per the elevations specified.
4. Remove and dispose of weeds, debris, stones with a diameter of 50 mm or larger, and soil contaminated by oil, gasoline and other deleterious materials off site.
5. Apply the fertilizer before placing the sod and incorporate to the first five (5) centimeters of topsoil at a rate of 3 kg per 100 cubic meters.
6. The use of liquid fertilizer, such as a 30-0-0 type fertilizer, or granular fertilizer with high nitrogen concentrations is prohibited.
7. The area under the left and right faces of the bastion will not require sodding. The Contractor will grade the area in order to allow the CCBN to sod the area. Sodding is required at the top of the masonry walls and at the bottom of the right flank.

### **3.2 SOD PLACEMENT**

1. Lay the sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
2. Lay the sod sections in rows perpendicular to the slope and stagger the joints. But all joints tightly together without overlapping or leaving gaps between the sections. Cut out irregular or narrow sections with sharp instruments.
3. The joints with the existing turf will be vertical and straight. Sod sections less than 300 mm in width and sections smaller than 400 mm x 400 m will not be accepted.

4. Roll the sod as instructed by the Departmental Representative. Use a light roller to ensure contact between the sod and soil. Using a heavy roller to correct surface irregularities is not permitted.

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

1. Install and secure geotextile fabric in the areas indicated, in accordance with the manufacturer's instructions.
2. Start laying the sod at the bottom of slopes.
3. Peg sod on slopes steeper than 3H :1V, within 1 m of catch basins and within 1 m of drainage channels and ditches, as follows:
  1. 100 mm below the top edge, 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 the Departmental Representative.
  4. Drive pegs to 20 mm above soil surface of sod sections.

### **3.4 MAINTENANCE DURING ESTABLISHMENT PERIOD**

1. Perform following operations from time of installation until acceptance.
2. Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
3. Cut grass to 60 mm when or prior to it reaching height of 100 mm. Remove clippings which will smother grassed areas, as directed by the Departmental Representative.
4. Maintain sodded areas 95% weed free.
5. Fertilize areas in accordance with the fertilizing program. Spread half of required amount of fertilizer in one direction and the remainder at right angles. Water in well.

### **3.5 ACCEPTANCE**

1. Turf Grass Nursery Sod areas will be accepted by the Departmental Representative provided that :
  1. Sodded areas are properly established.
  2. Sod is free of bare and dead spots.
  3. No surface soil is visible from a height of 1 500 mm when the grass has been cut to a height of 50 mm.
  4. Sodded areas have been cut a minimum of 2 times prior to acceptance.
2. Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by the Departmental Representative provided that:
  1. Sodded areas are properly established.
  2. The extent of surface soil visible when the grass has been cut to a height of 60 mm is acceptable.
  3. Sod is free of bare or dead spots and the extent of weeds apparent in grass is acceptable.
  4. Sodded areas have been cut a minimum of 2 times prior to acceptance.
  5. Fertilizing in accordance with fertilizer program has been carried out at least once.

3. Areas sodded in the fall will be accepted in the following spring one month after the beginning of the growing season, provided that acceptance conditions are fulfilled.

### **3.6 MAINTENANCE DURING WARRANTY PERIOD**

1. Perform the following operations from the time of acceptance until the end of the warranty period.
2. Water the commercial grade grown turf on a weekly basis in order to maintain an optimum moisture content up to a depth of 100 mm.
3. Mow the turf at the height indicated below and remove the cuttings likely to “choke” the sodded areas as instructed by the Departmental Representative. Implement grasscycling.
  1. Commercial grade grown turf
    1. Mow to a height of 60 mm during the normal growth period.
    2. Mow the turf as often as necessary when the indicated height is reached. The time interval between mowings will allow a reduction of the height of the grass by one third in one mowing.
4. Repair and re-sod dead or bare spots to the satisfaction of the Departmental Representative.
5. Fertilize the areas in accordance with the fertilizing program. Spread half of required amount of fertilizer in one direction and the remainder at right angles. Water in well.

### **3.7 CLEANING**

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

**END OF SECTION**

