



Lieu historique national du  
Canal-de-Chambly



Parcs  
Canada

Parks  
Canada

## CHAMBLY CANAL NHS - PATH SAFETY (SAFE TRAFFIC MANAGEMENT)

PROJECT NO : CCHM- 1449



### SPECIFICATIONS – TENDER

2 august 2019



**COUNCIL EXPERTS IDENTIFICATION :**

Landscape Architect:

OPTION aménagement

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**COUNCIL EXPERTS STAMPS :**

 <p>Landscape Architect</p>	 <p>Structural Engineer</p>	 <p>Civil Engineer</p>
	 <p>Traffic Engineering</p>	

**FIN DE LA SECTION**

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**DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS**

00 00 01	Cover Page
00 01 07	Seals Page
00 01 10	Table of Contents

**DIVISION 01 GENERAL REQUIREMENTS**

01 11 00	Summary of Work
01 14 00	Work Restrictions
01 29 00	Payment Procedures
01 31 19	Project Meetings
01 32 16.07	Construction Progress Schedule (Gantt)
01 33 00	Submittal Procedures
01 35 29.06	Health and Safety
01 35 43	Environmental Procedures
01 45 00	Quality Control
01 52 00	Construction Facilities
01 56 00	Temporary Barriers and Enclosures
01 61 00	Common Product Requirements
01 71 00	Examination and Preparation
01 74 11	Cleaning
01 74 21	Construction Demolition Waste Management and Disposal
01 77 00	Closeout Procedures
01 78 00	Closeout Submittals

**DIVISION 02 EXISTING CONDITIONS**

02 41 13	Selective Site Demolition
----------	---------------------------

**DIVISION 03 CONCRETE**

03 01 37	Concrete Restoration
03 10 00	Concrete Forming and Accessories
03 20 00	Concrete Reinforcing
03 30 00.01	Cast-in-Place Concrete

**DIVISION 05 METALS**

05 50 00.01	Steel Fencing
-------------	---------------

**DIVISION 06 WOOD, PLASTICS AND COMPOSITES**

06 05 73	Wood treatment
06 14 00	Treated Wood Foundations

**DIVISION 10 TRANSPORT**

10 14 53	Traffic Signage
----------	-----------------

**DIVISION 31 EARTHWORK**

31 00 00.01	Earthworks
31 05 16	Aggregate Materials
31 11 00	Clearing and Grubbing
31 23 33.01	Excavating, Trenching and Backfilling
31 24 13	Roadway Embankments
31 32 19.01	Geotextiles
31 36 00	Gabions

**DIVISION 32 EXTERIOR IMPROVEMENTS**

32 01 90.33	Tree and Shrub Preservation
32 11 16.01	Granular Sub-base
32 11 23	Aggregate Base Courses
32 12 16.01	Asphalt Paving
32 14 13	Precast Concrete Unit Paving
32 16 15	Concrete Walkways, Curbs and Gutters
32 17 23	Pavement Markings
32 37 00	Exterior Site Furnishings
32 91 19.13	Topsoil placement and grading
32 92 19.13	Mechanical Seeding
32 92 23	Sodding
32 93 10	Trees, Shrubs and Ground Cover Planting

**DIVISION 34 TRANSPORTS**

34 71 13.25	Vehicle W-Beam Guide Rail
-------------	---------------------------

**APPENDICES AND STUDY**

1	Proper Pruning Method
2	Exemple of an Environnemental protection plan (EPP)
3	Étude géotechnique, Englobe (french version only)

<b>LIST OF DRAWINGS</b>	<b>LANDSCAPE ARCHITECTURE</b>	<b>SIGNALING AND MARKING</b>	<b>CIVIL ENGINEERING</b>	<b>STRUCTURE</b>
FRONTISPIECE	AP-01			
LOCATION OF SECTORS	AP-02 @ AP-03	MS-01		
SECTOR 01 - CHAIN 0,25	AP-4 @ AP-5	MS-02		
SECTOR 02 - CHAIN 0,54	AP-6 @ AP-7	MS-03		
SECTOR 03 - CHAIN 0,69	AP-8 @ AP-11	MS-04 @ MS 05		S01 @ S03
SECTOR 07 - CHAIN 1,64	AP-12 @ AP-13	MS-06		
SECTOR 08 - CHAIN 1,74	AP-14 @ AP-15	MS-07		
SECTOR 09 - CHAIN 1,78	AP-16 @ AP-17	MS-08		
SECTOR 10 - CHAIN 1,87	AP-18 @ AP-19	MS-09		
SECTOR 12 - CHAIN 2,16	AP-20 @ AP-21	MS-10		
SECTOR 13 - CHAIN 2,41	AP-22 @ AP-23			
SECTOR 15 - CHAIN 2,56	AP-24 @ AP-25	MS-11		
SECTOR 16 - CHAIN 2,65				
SECTOR 17 - CHAIN 2,73	AP-26 @ AP-27	MS-12		
SECTOR 18 - CHAIN 3,43	AP-28 @ AP-29	MS-13		S04 @ S06
SECTOR 20 - CHAIN 6,28	- Hors-projet -			
SECTOR 20,1 - CHAIN 6,32		MS-14		
SECTOR 20,2 - CHAIN 8,03		MS-15		
SECTOR 21 - CHAIN 6,62	AP-30 @ AP-31	MS-16		
SECTOR 24 - CHAIN 8,96	AP-32 @ AP-33	MS-17		
SECTOR 26 - CHAIN 13,38	- Hors-projet -			
SECTOR 27 - CHAIN 13,55	AP-34 @ AP-35	MS-18		
SECTIONS AND DETAILS	AP-36 @ AP-52		C01 @ C09	

**END OF TABLE OF CONTENTS**

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## **PARTIE 1      GENERAL**

### **1.1              RELATED REQUIREMENTS**

- .1      Section 01 14 00 - Work Restrictions
- .2      Section 01 32 16.07 - Construction Progress Schedule (Gantt)
- .3      Section 01 56 00 - Temporary Barriers and Enclosures

### **1.2              WORK COVERED BY CONTRACT DOCUMENTS**

- .1      Context:

The Chambly Canal bike path is an NHS of well-known historic value. The multi-use path runs approximately 20 kilometres along the Richelieu River, linking the St. Lawrence River and Lake Champlain since 1843.

The Contractor must be cognizant of the issues and constraints and have the resources to fulfill the mandate. The creation of a multi-use path along the Chambly Canal brings to bear a number of factors including accessibility, safety, environmental protection, as well as historical and architectural considerations. The **BIG CHALLENGE** is undoubtedly improving safety and will involve accesses, links with the environment, signposting, bordering areas, and rest areas.

### **1.3              CONTRACT TYPE**

- .1      The contract is a combined lump sum and unit price contract.
- .1      The contract includes the work for all the batches and sectors specified.

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

- .1      Unrestricted use of site until Substantial Completion of work supplementary than the section 01 14 00 – Work restrictions, concern the acces at the site.
- .2      Use of the premises is restricted to the areas needed to execute the work, the accesses, work areas and storage areas to allow for occupation of the peripheral areas by the Contractor and the public.
- .3      Co-ordinate use of premises under direction of PCA Representative.
- .4      Obtain and pay for use of additional storage or work areas needed for the execution of the works under this Contract.
- .5      Remove or modify existing work to prevent damage to the parts of existing work which remain in place.
- .6      Repair or replace as directed by PCA Representative parts of existing work which have been altered during construction operations to match existing or adjoining works, in order to harmonize the works between them.
- .7      At completion of works, condition of existing work must be in an equal or better state than that which existed before new work started.



## **1.5 OWNER-FURNISHED ITEMS**

- .1 Responsibilities of the PCA Representative.
  - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
- .2 Responsibilities of the Contractor.
  - .1 Designate submittals and delivery date for each product in progress schedule.
  - .2 Review shop drawings, product data, samples, and other submittals. Submit to Consultant notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
  - .3 Receive and unload products at site.
  - .4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
  - .5 Handle products at site, including uncrating and storage.
  - .6 Protect products from damage, and from exposure to elements.
  - .7 Assemble, install, connect, adjust, and finish products.
  - .8 Provide installation inspections required by public authorities.
  - .9 Repair or replace items damaged by Contractor or subcontractor on site (under his control).

## **1.6 EXISTING UTILITIES SERVICES**

- .1 Before interrupting utility services, notify PCA Representative and concerned utility companies of intended interruption of services and obtain necessary authorizations.
- .2 If work involves breaking into or connecting to existing services, give PCA Representative a 48 hours 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 vehicular traffic.
- .3 Submit schedule to and obtain approval from PCA Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice of inconveniences to affected parties.
- .4 Where unlisted utility services are encountered, immediately inform PCA Representative and confirm findings in writing.
- .5 Protect, relocate or maintain existing active utility services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .6 Register locations of maintained, re-routed and abandoned utility service lines.
- .7 Construct barriers in accordance with Section 01 56 00 - Temporary accesses and protections.

## **1.7 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy of each of the following documents:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as indicated.
- .2 The Contractor must submit a detailed work plan and method to the PCA Representative for approval, for all work under this mandate in accordance with 1.4.1 of this section. Work on the site may not commence until approval of the Work Plan and Method is approved by the Departmental Representative.

## **PARTIE 2 PRODUCTS**

### **2.1 NOT USED.**

- .1 Not used.

## **PARTIE 3 EXECUTION**

### **3.1 NOT USED.**

- .1 Not used.

**END OF SECTION**



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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENT**

- .1 Section 01 32 16.07 - Construction Progress Schedule (Gantt).

**1.2 ACCESS AND EGRESS**

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

**1.3 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of adjacent buildings, occupants of these buildings and the public. Make arrangements with PCA Representative to facilitate work as stated.
- .2 Maintain existing utilities services to building and provide access for professionals and vehicles.
- .3 Where security is reduced by work provide temporary means to maintain security of goods and people on the premises.
- .4 Install and maintain sanitary facilities for the personnel.

**1.4 MODIFICATIONS, REPAIRS**

- .1 Execute work with least possible interference or disturbance to normal use of adjacent buildings, occupants of these buildings and the public. Make arrangements with PCA Representative to facilitate work as stated.

**1.5 EXISTING SERVICES**

- .1 Notify PCA Representative and utility companies of intended interruption of services and obtain required permission before proceeding.
- .2 Notify PCA Representative of any interruption of services at least 48 hours ahead of electrical service interruptions and minimise duration.
- .3 Provide for personnel, pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

**1.6 SPECIAL REQUIREMENTS**

- .1 Carry out noise generating work Monday to Friday, from 7 a.m. to 5 p.m.
- .2 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule.
- .3 Ensure personnel working on the site are familiar and comply with fire safety, vehicular circulation and work safety regulations.

## **1.6 SPECIAL REQUIREMENTS (CONT'D)**

- .4 Remain within work and access boundaries.
- .5 Work schedule and site access by Contractor's vehicles is between 7 a.m. and 5 p.m. The Contractor may work evenings upon approval from the PCA Representative. Equipment maintenance is not allowed outside the work schedule. Waiting vehicles must turn off engines.
- .6 Deliver materials outside peak traffic periods, i.e., between 9 a.m. and 3 p.m., unless indicated otherwise by PCA Representative. Deliveries outside the work schedule are not allowed.

## **1.7 HISTORICAL/ARCHAEOLOGICAL CONTROL**

- .1 Particularities:
  - .1 Le lieu historique national du Canada a été reconnu par le gouvernement Canadien comme l'un des sites ayant la plus haute valeur patrimoniale. Ainsi, tous travaux d'excavation du sol reconnu comme pouvant contenir des vestiges doivent faire l'objet d'une surveillance d'un archéologue désigné par le Représentant de l'APC.  
Ainsi, tous les travaux d'excavation nécessaires à la réalisation des travaux d'aménagement du sentier multifonctionnel font l'objet de la présente section.
- .2 Accesses and collaboration:
  - .1 The Contractor must cooperate and comply with all instructions given by the PCA Representative during excavation work to avoid the loss of archeological information on the site.
  - .2 The Contractor must facilitate access for and collaborate with the Archeologist. The Archeologist or the Archeologist's representative will be present on the Work site as needed for protecting and recording the finds. Their role will be to guide the Contractor to avoid the loss of archeological information and to collect information on the finds.
  - .3 The Contractor must enable the archeological team to examine and take samples of the archeological finds.
- .3 Archeological finds:
  - .1 The Contractor must notify the PCA Representative of any archeological finds (construction and building vestiges, objects and fragments) on the site and await written instructions from the PCA Representative before continuing work in the area of the find.
  - .2 Vestiges, antiquities and other elements of historic, archeological or scientific interest (vestiges, objects or fragments) found on the site or areas to be excavated or demolished are the property of Canada. The Contractor must protect the finds and obtain instructions from the PCA Representative in their regard.
- .4 Work stoppage:
  - .1 The Contractor must provide five minutes work stoppages per hour at the Contractor's expense for excavation work in areas requiring the Archeologist's presence. Unused work stoppages will be accumulated to be used at a later date if necessary. A time sheet for unused time will be maintained by the PCA Representative in collaboration with the Contractor and Archeologist.

**1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL (CONT'D)**

- .2 The PCA Representative will evaluate work stoppages over 30 minutes and notify the Contractor accordingly. The Contractor may be required to reassign equipment to other areas to enable the archeological work to continue. If reassignment is not possible, the Contractor will be compensated via the time bank or as agreed at the start-up meeting if the time bank is empty.
- .3 In the event of accidental discoveries of cultural artifacts made in the absence of an archaeologist, the project manager and/or the general contractor, work in the immediate area of the discovery must be stopped and the PCA Representative notified.
- .5 Manual excavation for archeological purposes:
  - .1 Given the possibility of archeological finds, the Contractor is advised that manual excavation may be required during operations as well as other work required to protect the finds. The Contractor will be compensated in accordance with the start-up meeting agreements.
- .6 Protection of vestiges and work:
  - .1 The Contractor must take all reasonable precautions during excavations and other work to protect any vestiges that may be unearthed and enable their examination by the archeologists. The PCA Representative will not tolerate any deviation from this practice. The Contractor will be liable for negligence causing the deterioration of a vestige and Canada will determine the consequences.
  - .2 In the event that the PCA Representative authorizes the demolition of elements on the site, the Contractor will take the necessary measures to protect adjacent work that are not to be demolished. If damage occurs during the Work immediately notify the PCA Representative.

**1.8 RESTRICTIONS TO CIRCULATION AND AREAS AFFECTED BY THE WORK**

- .1 As part of this project, work in sectors 3 (Wall Repair), 18 (Bridge 4), 17, 21 and 27 (Spillways 3, 4 and 5) must be carried out outside the shipping period.
- .2 The canal's operating hours are as follows:
  - .1 2019 season – May 17 to October 14
  - .2 2020 season – May 15 to October 12
- .3 Work in the other sections must never interfere with canal operations and shipping.
- .4 In the event that the path must be closed for a short time, the Contractor must provide for a detour and signposting.

**PART 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not used.

**PART 3      EXECUTION**

**3.1            NOT USED.**

.1      Not used.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 UNIT OR LUMP SUM PRICES**

- .1 Each unit or global price is for lump sum payment. The Contractor agrees to carry out the work for the unit price for a gain or a loss. The unit or or global price for work must compensate for all expense, work, disbursements, payments, direct and indirect expenses, mobilizations, demobilizations and all acts, deeds, facts, responsibilities, obligations, omissions and errors on the Contractor' part during the course of this work.
- .2 For the same unit or global price, the Contractor provides the materials, personnel and accessories necessary for execution of the work, unless otherwise indicated.
- .3 The unit or global price also includes the transportation and installation of materials, and the company's general expenses including administration, insurance, contributions and fees, interest, taxes and other incidental expenses. It must include losses and damages that may result from the work, fluctuations in prices and salaries, risks to the company, strikes, delays unattributable to the PCA Representative, transportation restrictions, accidents and acts of God.

**1.2 LUMP SUM PAYMENT: Definition**

- .1 Where work is determined accurately and detailed fashion and a comprehensive price is agreed upon and accepted by the two parties.

**1.3 UNIT PRICE: Definition**

- .1 Where specifications associated with the work are determined in a precise and detailed fashion and all quantities or certain quantities on the schedule are provided for estimation purposes.

**1.4 COST BREAKDOWN SCHEDULE**

- .1 Before requesting payment of the first installment, present a detailed breakdown of costs as required by the Representative of the Ministry for the articles at fixed price. Once approved by the PCA Representative, the breakdown of costs as a basis for calculating interim payments.
  - .1 The breakdown must include the following minimum items:
    - .1 All work shown and described on Demolition drawings / Existing Conditions and on specifications (max 15%).
    - .2 Electrical including bases, lampposts, conduits, connections/junctions.
    - .3 Staircase (wood and steel), concrete foundation.
    - .4 Path including foundation, paving.
    - .5 Stone steps including foundation.



## 1.5 DESCRIPTION OF ITEMS

### .1 Site preparation and demolition

#### .1 Organization of construction site

The section includes all requirements described in Division 01 - General Requirements of this specification and also including all the other work that is not an integral part of other items.

Payment of this item will be as follows:

- .1 25% with the first monthly payment.
- .2 50% divided equally among the subsequent payments.
- .3 25% with the payment issued with the Substantial Completion (interim).
- .4 The Organization of Construction Site item must not exceed 15% of the total value of the tender.

#### .2 Demolition and site preparation

- .1 Under "**Tree (s) / shrub (s) to be felled, to be removed**" the Contractor must submit a unit price per square meter which includes, but is not limited to, labour, machinery and tools required for the work, as stipulated in the plan and specifications, as well as any incidental expenses for the proper execution of the work.
- .2 Under "Demolition of the hydro-Québec cabinet (by others)"
- .3 Under "**Demolition of existing concrete slab - ep. 90 mm (Detail 14-C02)**" the Contractor must submit a unit price per square meter that includes, but is not limited to, demolition of the slab, labour, machinery and equipment required for the demolition according to the specified thickness, and transportation of materials to a location approved by the PCA Representative, as stipulated in the plan and specifications, as well as any incidental expenses for proper completion of the work.
- .4 Under "**Demolition of existing slider**" the Contractor must submit a unit price per square meter that includes, but is not limited to, demolition of the slider, labour, machinery and equipment required for the demolition according to the specified thickness, and transportation of materials to a location approved by the PCA Representative, filling holes, compacting materials, hosing down materials as required, as stipulated in the plan and specifications, as well as any incidental expenses for proper completion of the work.
- .5 Under "**Demolition of existing concrete curb**" the Contractor must submit a unit price per linear meter that includes, but is not limited to, demolition of the existing concrete slab, labour, machinery and equipment required for the demolition according to the specified thickness, and transportation of materials to a location approved by the PCA Representative, as stipulated in the plan and specifications, as well as any incidental expenses for proper completion of the work.

## 1.5 DESCRIPTION OF ITEMS (CONT'D)

### .2 Poured concrete

- .1 Under "**Poured concrete curb**" the Contractor must submit a unit price per linear meter which includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling and repair of surfaces up to 1 m behind the back of the curb, excavation, formwork for cast-in-place curbs, machinery and tools required for placement according to thickness specified, transportation of materials, compaction of materials, watering of materials if required, sample materials, connections to existing surfaces respecting the transitions specified in this specification, and any incidental expense to the proper completion of the work.
- .2 Under "**Poured Concrete Surface**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to the specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, formwork if required, and galvanized steel wire mesh, surface finish and various joints, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .3 Under "**Concrete Sidewalk with Monolithic Curb**" the Contractor must submit a unit price per square meter that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to the specified thickness, transport of materials, compaction of materials, watering of materials if required, the materials used as samples, tests, connections to existing surface, formwork if required, and galvanized steel wire mesh, surface finish and various joints, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .4 Under "**Poured Concrete Slab along the existing concrete wall**" the Contractor must submit a unit price per square meter that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, formwork if required, and galvanized steel wire mesh, surface finish and various joints, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .5 Under "**Concrete Base for Fence**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, sonotubes, formwork if required, and galvanized steel wire mesh, surface finish and various joints, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.

**1.5 DESCRIPTION OF ITEMS (CONT'D)**

- .6 Under "**Concrete Base for Bollard**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, sonotubes, formwork if required, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .7 Under "**Concrete Base for Guardrail**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, formwork if required, anchors, reinforcing, hardware and sonotubes as stipulated in plan and specifications, as well as any incidental expense to the proper completion of work.
- .8 Under "**Concrete Base for Interpretation Panel**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, sonotubes, formwork if required, and galvanized steel mesh, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .9 Under "**Concrete Base for Table**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, sonotubes, formwork if required, and galvanized steel mesh, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .10 Under "**Concrete Base for Bench**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, sonotubes, formwork if required, and galvanized steel mesh, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .11 Under "**Concrete Base for Bike Rack**" the Contractor must submit a unit price that includes, but is not limited to, the supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, sonotubes, formwork if required, and galvanized steel mesh, as stipulated in plan and specifications, as well as any incidental expense to the proper completion of work.

**1.5 DESCRIPTION OF ITEMS (CONT'D)**

- .12 Under "**Concrete Base for Bike Repair Station**" the Contractor must submit a unit price that includes, but is not limited to, the supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, sonotubes, formwork if required, as stipulated in the plan and specifications, as well as any incidental expense to proper completion of work.
- .13 Under "**Concrete Base for Waste and Recycling Bins**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, formwork if required, and galvanized steel mesh, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .14 Under "**Concrete Base for Drinking Fountain**" the Contractor must submit a unit price that includes, but is not limited to, supply and installation of fresh materials and concrete, studs, connections (water, sewer) up to three metres, curing compound, backfilling machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, sonotubes, formwork if required, and galvanized steel mesh, as stipulated in plan and specifications, as well as any incidental expense to the proper completion of work.
- .15 Under "**Canal Head Wall Repair**", the Contractor must submit a unit price per linear meter that includes, but is not limited to, partial demolition, formwork, supply and installation of materials and fresh concrete, reinforcements, anchors, curing compound, any backfilling, machinery and equipment necessary for the proper performance of the work, transportation of materials, sample materials, tests, connections to existing structure, as well as any incidental expenses for the proper completion of the work, all of which is in accordance with the plans and specifications.
- .16 Under "**Canal Wall Base Repair**", the Contractor must submit a unit price per linear meter that includes, but is not limited to, partial demolition, formwork, supply and installation of materials and fresh concrete, reinforcements, anchors, curing compound, any backfilling, machinery and equipment necessary for the proper performance of the work, transportation of materials, sample materials, tests, connections to existing structure, as well as any incidental expenses for the proper completion of the work, all of which is in accordance with the plans and specifications.

**1.5 DESCRIPTION OF ITEMS (CONT'D)**

- .17 Under "**Parking Lot Retaining Wall Repair**", the Contractor must submit a unit price per square meter that includes, but is not limited to, partial demolition, formwork, supply and installation of materials and fresh concrete, reinforcements, anchors, curing compound, backfilling, machinery and equipment necessary for the proper performance of the work, transportation of materials, sample materials, tests, connections to existing structure, as well as any incidental expenses for the proper completion of the work, all of which is in accordance with the plans and specifications.
- .3 Guardrail and steel fence
- .1 Under "**Guardrail on concrete or steel slideway**" the Contractor must submit a unit price, according to the specifications of the schedule, which includes, but is not limited to, supply and implementation of materials, machinery and equipment required for placement in specified thickness, transportation of materials, compaction of materials, sample materials, connections to existing surface as specified in plan and specifications and in particular section 05 50 00.01 "Guardrail and steel fence", as well as any incidental expenses for the proper performance of the work.
- .2 Under "**Guardrail on Sonotube or Existing Concrete Surface**" the Contractor must submit a unit price, according to the specifications of the schedule, which includes, but is not limited to, supply and implementation of materials, machinery and equipment required for placement in specified thickness, transportation of materials, compaction of materials, sample materials, connections to existing surface as specified in plan and specifications and in particular section 05 50 00.01 "Guardrail and steel fence", as well as any incidental expenses for the proper performance of the work.
- .3 Under "**Metal Fence**" the Contractor must submit a unit price, according to the specifications of the schedule, which includes, but is not limited to, the supply and use of materials, machinery and equipment required for placement in the specified thickness, transportation of materials, compaction of materials, sample materials, connections to existing surface as specified in the plan and specifications and in particular section 05 50 00.01 "Guardrail and steel fence", as well as any incidental expenses for the proper performance of the work.
- .4 Wood wing walls
- .1 Under "**Partial Demolition and Installation of New Beams**", the Contractor must submit a unit price that includes, but is not limited to, partial demolition, excavation, supply and installation of materials and fresh concrete, anchors, curing compound, backfilling, machinery and equipment necessary for the proper performance of the work, transportation of materials, sample materials, tests, connections to the existing structure, as well as any incidental expenses for the proper completion of the work, all of which is in accordance with the plans and specifications.

## 1.5 DESCRIPTION OF ITEMS (CONT'D)

### .5 Signposting

- .1 Under "**Signposting Panel**", the supply of materials, fastenings and accessories as well as the installation of the panels will be paid by panel unit according to the specifications of the schedule.

Supply and installation of poles and accessories will be paid by the unit, according to the specifications of the schedule.

The Contractor must submit prices that include, but are not limited to, the supply of materials, machinery and tools required for installation (fasteners and accessories as well as installation), transportation of materials, materials used as samples, tests, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of the work.

- .2 Under "**Signposting Panel to be Removed**", the supply of materials, fixings and accessories as well as the installation of the panels will be paid by panel unit according to the specifications of the schedule.
- .3 Under "**Signposting Panel to be Relocated**", the supply of materials, fixings and accessories as well as the installation of the panels will be paid by panel unit according to the specifications of the schedule.
- .4 Under "**Small Signposting Post to be removed**" the removal and disposal of posts and accessories will be paid by the unit, according to the specifications of the schedule.
- .5 Under "**Small U-shaped ribbed Rib-Bak Type Signposting Post to be Removed**" the removal and disposal of posts and accessories will be paid by the unit, according to the specifications of the schedule.

### .6 Landscaping

- .1 Under "**Basic Landscaping**" the Contractor must submit a lump sum price that includes, but is not limited to, 1st and 2nd class excavation and / or contaminated to be reused on site, backfill, cost of materials, equipment and manpower necessary for the complete execution of work and repair of the areas affected by the work. The lump sum price must include all minor work necessary for the complete execution of these including excavation and disposal of materials regardless of soil type, preparation of the surface, base, backfilling and compaction of materials, loading of stockpiled material, transportation to the prescribed area, stripping of topsoil where required, placement, levelling, drainage, transitions, placing and compaction of relocated materials, as stipulated in plans and specifications.
- .2 Under "**Bituminous Concrete Surface– Multi-use Trail**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply of materials, machinery and tools necessary, according to the specified thickness, the transport of materials, the compaction of materials, the watering of materials if required, the materials used as samples, tests, connections to the existing surface, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.

**1.5 DESCRIPTION OF ITEMS (CONT'D)**

- .3 Under "**Stone Dust Surface – Multi-use Trail**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply of materials, machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to the existing surface, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
  - .4 In the article "**Relocated Stones**" the Contractor must submit a lump sum price that includes, but is not limited to, machinery and equipment necessary for the transportation and placement of the stones, compaction of materials, such as stipulated in the plan and specifications, as well as any incidental expenses for the proper execution of the work.
  - .5 Under "**Bituminous Concrete Surface**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply of materials, machinery and tools necessary, according to specified thickness, transport of materials, compaction of materials, watering of materials if required materials used as samples, tests, connections to the existing surface, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
  - .6 Under "**Talus Improvement**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply of materials, machinery and tools necessary, according to the specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to the existing surface, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
  - .7 Under "**Gabions**", the Contractor must submit a unit price that includes, but is not limited to, partial demolition, excavation, supply and installation of materials, support pad, backfilling, machinery and equipment necessary for the proper performance of the work, transportation of materials, sample materials, tests, connections to the existing structure, as well as any incidental expenses for the proper completion of the work, all of which is in accordance with the plans and specifications.
- .7 Bituminous concrete
- .1 Under "**Bituminous Concrete – Multi-use Trail**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply of materials, machinery and tools necessary, according to the specified thickness, the transport of materials, the compaction of materials, the watering of materials if required, the materials used as samples, the tests, the connections to the existing surface, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
  - .2 Under "**Bituminous Concrete - Surface**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply of materials, machinery and tools necessary, according to the specified thickness, the transport of materials, the compaction of materials, the watering of materials if required, the materials used as samples, the tests, the connections to the existing surface, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.

**1.5 DESCRIPTION OF ITEMS (CONT'D)**

- .8 Concrete paver
- .1 Under "**Bituminous Concrete Surface**" the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply of materials, machinery and tools necessary, according to the specified thickness, transport of materials, compaction of materials, watering of materials if required, materials used as samples, tests, connections to existing surface, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.
- .2 In the article "**Precast Concrete Steps**" the Contractor must submit a lump sum price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the placement of materials, transportation and the compaction of the materials, watering of the materials if required, materials used as samples, as stipulated in the plan and specifications, more specifically in section 32 14 13 "Paving with precast concrete pavers", as well as any incidental expenses to the proper completion of the work.
- .9 Marking:
- .1 Under "**Trail Marking**", the Contractor must submit a price per linear meter of continuous or discontinuous, spaces excluded.  
The letters and symbols marked will be measured in units.  
The Contractor must submit prices that include, but are not limited to, the supply of materials, machinery and tools required for installation, transportation of materials, materials used as samples, tests, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of the work.
- .10 Furniture / Equipment
- .1 Under "**Fixed Bollard**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the installation, transportation of materials, materials specimens, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expenses for the proper completion of the work.
- .2 Under "**Movable Bollard**", the Contractor must submit a unit price that includes, but is not limited to, the supply of materials, machinery and tools required for installation, transportation of materials, materials used as samples, tests, as stipulated in the plan and specifications, specifically section 32 37 00, as well as any incidental expense to the proper completion of the work.
- .3 In the article "**Bench**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the establishment, transportation of materials, materials specimens, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expenses for the proper completion of the work.
- .4 In the section "**Relocated Bench**" the Contractor must submit a unit price which includes, but is not limited to, machinery and tools necessary for the installation, transportation of materials, as stipulated in the plan and specifications. as well as any incidental expenses for the proper performance of the works.



**1.5 DESCRIPTION OF ITEMS (CONT'D)**

- .5 In the article "**Waste and Recycling Basket**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the installation, transportation of materials, materials used as samples, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expenses for the proper completion of the work
- .6 In the section "**Picnic Table**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the installation, transportation of materials, materials used as samples, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expenses for the proper completion of the work
- .7 In the article "**Accessible Picnic Table**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the installation, transportation of materials, materials used as samples, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expenses for the proper completion of the work
- .8 Under "**Bicycle Rack**", the Contractor must submit a unit price that includes, but is not limited to, the supply of materials, machinery and tools required for installation, transportation of materials, materials used as samples, tests, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expense to the proper completion of the work.
- .9 Under "**Drinking Fountain**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the installation, transportation of materials, materials used as samples, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expenses for the proper completion of the work
- .10 Under "**Bicycle Repair Station**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the installation, transportation of materials, materials used as samples, as stipulated in the plan and specifications, specifically section 32 37 00 "Street Furniture", as well as any incidental expenses for the proper completion of the work
- .11 Under "**Marking Strip**" the Contractor must submit a unit price which includes, but is not limited to, the supply of materials, machinery and equipment necessary for the installation, transportation of materials, materials specimens, as stipulated in the plan and specifications, specifically section 32 37 00 "Urban Furniture", as well as any incidental expenses for the proper completion of the work.
- .12 Under "**Relocated Interpretation Panel**" the Contractor must submit a unit price which includes, but is not limited to, the machinery and equipment required for the placement, transportation of materials as specified in plan and estimate, as well as any incidental expense to the proper completion of the work.

## 1.5 DESCRIPTION OF ITEMS (CONT'D)

### .11 Seeding

Under "**Seeding**" and "**Seeding with topdressing**" the Contractor must submit unit prices per square meter which include, but are not limited to, the supply of materials, machinery and equipment necessary for seeding, transportation of materials, materials specimens, as specified in the plan and specifications, specifically in sections 32 92 20 "Mechanical Seeding" and 32 91 19 "Topsoil and Finishing Levelling", as well as any incidental expenses incurred in carrying out proper form of work.

### .12 Grassing

Under "**Sod**", the Contractor must submit a unit price per square meter that includes, but is not limited to, the supply and application of the compost to a thickness of 150 mm after settlement; supply and installation of turf; spreading of rooting fertilizer; sodding, watering until properly established and maintenance, the supply of materials, the machinery and tools necessary for installation, transport of materials, materials used as samples, as stipulated in plan and specifications, specifically in Sections 32 92 23 "Sodding" and 32 91 19 "Topsoil and Finishing Leveling", as well as any incidental expenses for the proper completion of the work.

### .13 Planting

Under "**Tree**", "**Shrubs**" and "**Perennials**", the Contractor must submit unit prices which include, but are not limited to, potting soil, mulch, watering until its recovery, maintenance and warranty, supply of materials, machinery and tools necessary for the installation, transportation of materials, sample materials, as stipulated in the plan and specifications, specifically in sections 32 93 10 "Plantation" and 32 91 19 "Establishment of topsoil and leveling finish ", as well as any incidental expense to the proper completion of the work.

### .14 Security slider

- .1 Under "**Security Slider Installation**" the Contractor must submit a unit price per linear metre that includes, but is not limited to, the supply and installation of sliders, posts and treated wood spacers, studs, bolts, washers, nuts, wrap, machinery and tools necessary, according to the specified quantities, the transport of materials, the compaction of materials, the watering of materials if required, the materials used as samples, compliance certificates, tests, connections to existing slider, as stipulated in the plan and specifications, as well as any incidental expense to the proper completion of work.

## PART 2 PRODUCTS

### 2.1 NOT USED.

- .1 Not used.

**PART 3            PARTIE 3 EXECUTION**

**3.1                NOT USED.**

.1                Not used.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 32 16.06 – Construction Progress Schedule – Critical Path Method (CPM).

**1.2 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of PCA Representative.
- .2 Distribute written notice of each meeting three (3) days in advance of meeting date to PCA Representative.
- .3 PCA Representative to provide physical space for meetings.
- .4 PCA Representative to preside at meetings.
- .5 PCA Representative to record the meeting minutes, including significant proceedings and decisions, and identifying actions by parties.
- .6 PCA Representative distribute copies of minutes within seven (7) days after meetings and transmit to meeting participants, affected parties not in attendance.
- .7 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.3 PRECONSTRUCTION MEETING**

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 PCA Representative or Departmental Senior representatives, Contractor, major Subcontractors, field inspectors, supervisors and NBCC representative will be in attendance.
- .3 PCA Representative to establish time and location of meeting and notify parties concerned minimum seven (7) days before meeting.
- .4 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 32 16.06 – Construction Progress Schedule – Critical Path Method.
  - .3 Schedule of submission of shop drawings, samples, and colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .5 Delivery schedule of specified materials and equipment in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.
  - .6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

**1.3 PRECONSTRUCTION MEETING (cont'd)**

- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .8 Owner provided products.
- .9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.

**1.4 PROGRESS MEETINGS**

- .1 During course of Work, schedule progress meetings once every two (2) weeks.
- .2 Contractor, major Subcontractors involved in Work, PCA Representative are to be in attendance.
- .3 PCA Representative to preside at meetings.
- .4 PCA Representative to record the meeting minutes, including significant proceedings and decisions, and identifying actions by parties.
- .5 PCA Representative to make of minutes of meetings and circulate by e-mail to attending parties and affected parties not in attendance within 7 days after meeting.
- .6 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Coordination between NBCC and other external parties.
  - .3 Review of Work progress since previous meeting.
  - .4 Health and Safety.
  - .5 Communication plan, emergency measures and list of parties involved.
  - .6 Quality control.
  - .7 Shop drawings.
  - .8 Field observations, problems, conflicts.
  - .9 Problems which impede construction schedule.
  - .10 Review of off-site fabrication delivery schedules.
  - .11 Corrective measures and procedures to regain projected schedule.
  - .12 Revision to construction schedule.
  - .13 Progress schedule, during succeeding work period.
  - .14 Review submittal schedules: expedite as required.
  - .15 Review proposed changes for affect on construction schedule and on completion date.
  - .16 Notice of proposed changes.
  - .17 Potential claims.
  - .18 Other business.

**PART 2      PRODUCTS**

**2.1            NOT USED.**

.1      Not used.

**PART 3      EXECUTION**

**3.1            NOT USED.**

.1      Not used.

**END OF SECTION**



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## **PARTIE 1      GENERAL**

### **1.1            RELATED REQUIREMENTS**

- .1      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. (PRIMAVERA or MS Project).
- .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 PCA Representative to enable monitoring of project work in relation to established milestones.

### **1.3            REQUIREMENTS**

- .1      Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2      Plan to complete Work in accordance with prescribed milestones and time frame.
- .3      Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4      Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.



**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to PCA Representative within ten (15) 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 PCA Representative within 5 working days of receipt of acceptance of Master Plan.

**1.5 PROJECT MILESTONES**

BATCH	WORK SITE	SCHEDULE		SECTOR	NAME OF SECTOR
	Priorities	Start	End		
BATCH 1	Fall 2019	2019-09-02	2019-11-08	1	Av. Bourgogne
	Fall 2019	2019-09-02	2019-11-08	2	Parc des Ateliers
	Fall 2019	2019-09-02	2019-11-08	7	Rue St-Georges
	Fall 2019	2019-09-02	2019-11-08	8	Rue des Pins
	Fall 2019	2019-09-02	2019-11-08	9	Rue de L'Église
	Fall 2019	2019-09-02	2019-11-08	10	Rue St-Jacques
	Fall 2019	2019-09-02	2019-11-08	24	Old bridge 9
BATCH 2	Spring 2020	2020-04-27	2020-06-23	20.1	Moorings 6,32
	Spring 2020	2020-04-27	2020-06-23	20.2	Moorings 8,03
	Spring 2020	2020-04-27	2020-06-23	21	Spillway 4
	Spring 2020	2020-04-27	2020-06-23	27	Spillway 5
BATCH 3	Fall 2020	2020-09-02	2020-11-06	13	CN bridge
	Fall 2020	2020-09-02	2020-11-06	15	Bridge 3
	Fall 2020	2020-09-02	2020-11-06	17	Spillway 3
	Fall 2020	2020-09-02	2020-11-06	18	Bridge 4
	Fall 2020	2020-09-02	2020-11-06	3	Friends of the canal rest area
	Fall 2020	2020-09-02	2020-11-06	3	Friends of the canal rest area
	Fall 2020	2020-09-02	2020-11-06	12	Bridge R112

**1.6 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 PCA Representative will review and return revised schedules within ten 10 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 Establish project schedule based on master plan.

**1.8 PROJECT SCHEDULE REPORTING**

- .1 Update a work schedule once every two (2) weeks, to reflect changes to activities, completion of activities and activities underway.

**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.

**PARTIE 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not used.

**PARTIE 3 EXECUTION**

**3.1 NOT USED.**

- .1 Not used.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 45 00 – Quality control.

**1.2 ADMINISTRATIVE**

- .1 Submit to PCA 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 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to PCA 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.
- .6 Notify PCA Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by PCA Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by PCA Representative review.
- .10 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 Contractor to illustrate details of a portion of Work.
- .2 Submit drawings specified in the technical sections stamped and signed by professional engineer registered or licensed in Quebec, Canada.
- .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.

**1.3 SHOP DRAWINGS AND PRODUCT DATA (cont'd)**

- .4 Allow 7 days for PCA Representative's review of each submission.
- .5 Adjustments made on shop drawings by PCA Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to PCA Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as PCA Representative may require, consistent with Contract Documents. When resubmitting, notify PCA Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 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 PCA Representative's review, distribute copies.
- .10 Submit one electronic copy of shop drawings for each requirement requested in specification Sections and as PCA Representative may reasonably request.

**1.3 SHOP DRAWINGS AND PRODUCT DATA (cont'd)**

- .11 Submit 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by PCA Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit 1 electronic copy of test reports for requirements requested in specification Sections and as requested by PCA 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.
- .13 Submit 1 electronic copy of certificates for requirements requested in specification Sections and as requested by PCA 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.
- .14 Submit 1 electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by PCA 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.
- .15 Submit 1 electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by PCA Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit 1 electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by PCA Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by PCA Representative, no errors or omissions are discovered or if only minor corrections are made, electronic 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 review of shop drawings by PCA Representative is for the sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that the PCA Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

**1.3 SHOP DRAWINGS AND PRODUCT DATA (cont'd)**

- .2 Without restricting generality of foregoing, 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.

**1.4 SAMPLES**

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to PCA Representative's site office.
- .3 Notify PCA 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 PCA Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to PCA Representative prior to proceeding with Work.
- .6 Make changes in samples which PCA 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 MOCK-UPS**

- .1 Erect mock-ups in accordance specified in the technical sections with 01 45 00 - Quality Control.

**1.6 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of colour digital photography in standard resolution monthly with progress statement as directed by PCA Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Frequency of photographic documentation: as directed by PCA Representative.
  - .1 Upon completion of: excavation, foundation, framing and services before concealment, of Work, as directed by PCA Representative.

**1.7 CERTIFICATES AND TRANSCRIPTS**

- .1 Submit documents required by the Commission des normes et d'équité, de la santé et de la sécurité au travail (CNESST), immediately after notice of acceptance of tender.
- .2 Submit transcription of insurance immediately after award of Contract.

**PART 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not used.

**PART 3      EXECUTION**

**3.1            NOT USED.**

.1      Not used.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 PRIORITIES**

- .1 Section 01 33 00 - Submittal Procedures

**1.2 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Association canadienne de normalisation (CSA).
- .3 Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Data Safety Sheets (MDSS).
- .4 Province of Quebec
  - .1 An Act Respecting Occupational Health and Safety, R.S.Q., c.S-2.1 (current edition).
  - .2 Commission des normes et d'équité, de la santé et de la sécurité au travail (CNESST) law, regulations and standards.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit copies of site startup and closeout notices for CNESST to PCA representative.
- .3 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .4 Submit 1 copy of Contractor's authorized representative's work site health and safety inspection reports to PCA Representative.
- .5 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .6 Submit copies of incident and accident reports.
- .7 PCA Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to PCA Representative within 7 days after receipt of comments from PCA Representative.
- .8 PCA Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to PCA Representative.



- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

#### **1.4 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award. Contractor to submit written acknowledgement to CNESTT along with Ouverture de Chantier Notice.
- .3 Work shall be done in designated work zone locations.
- .4 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

#### **1.5 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

#### **1.6 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with PCA Representative prior to commencement of Work.

#### **1.7 REGULATORY REQUIREMENTS**

- .1 Draw up site-specific health and safety plan based on prior evaluation of risks and hazards prior to commencing Work. Put plan into application and ensure full compliance until end of work activities. The health and safety plan must take project particularities into account.
- .2 The PCA Representative may submit concerns in writing regarding inconsistencies in the plan and require revised plan eliminating inconsistencies or identifying corrective measures to be taken.

#### **1.8 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
- .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 Health and Safety Plan.

## **1.9 COMPLIANCE REQUIREMENTS**

- .1 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

## **1.10 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Quebec and advise PCA Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Quebec and advise PCA Representative verbally and in writing.

## **1.11 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work.

## **1.12 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Quebec, and in consultation with PCA Representative.

## **1.13 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by PCA Representative.
- .2 Provide PCA Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 PCA Representative may stop Work if non-compliance of health and safety regulations is not corrected.

## **1.14 BLASTING**

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

### **1.15 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

### **1.16 LOCK-OUT PROCEDURES**

- .1 Procedure:
  - .1 The Contractor must draft and apply a procedure for locking out all equipment and systems that are operated or powered. The procedure must comply with the guidelines outlined in the document entitled "Le cadenassage" published by the Association paritaire en santé et sécurité du secteur de la construction (ASP Construction), which must be included in the prevention program.

### **1.17 DIGGING**

- .1 Exploratory works: digging, drilling, core sampling, etc. are covered by the Safety Code for the Construction Industry. Consequently, the Contractor must take all necessary precautions to prevent accidents.
- .2 The Contractor must assume all responsibilities assigned to the principal contractor as set forth under the Safety Code for the Construction Industry and act as site supervisor. Prior to commencement of Work, the Contractor must:
  - .1 Provide the Consultant with a work safety plan and mechanical inspection certificate for each piece of equipment used on the Work site.
  - .2 Ensure workers have received training and information needed to carry out Work safely and all tools and protective gear are available and used in accordance with the applicable standards, laws and regulations.
  - .3 Comply at all times with the Act Respecting Occupational Health and Safety and the Safety Code for the Construction Industry.
  - .4 Advise all workers that they are entitled to turn down work involving a health and/or safety hazard.
  - .5 Mark out and barricade work zone and control access.
- .3 In the event of an accident, take all necessary measures including halting work to ensure the health and safety of the workers and public and promptly contact the PCA Representative.

### **1.18 SPECIFIC CONDITIONS FOR WORK AT HEIGHT**

- .1 The Contractor must provide protection for workers working at heights greater than 2.4 metres.
- .2 Plan and organize Work to minimize hazards at source and provide general protection for the purpose of minimizing recourse to equipment for individual protection. Workers must use safety harness compliant with CAN - CSA- Z-259.10 - M90 wherever individual protection is required. Safety harness alone must not be used as protection against falls.
- .3 Safety harness must worn on all lifting platforms with telescopic, articulated and rotating booms.
- .4 Mark off danger zones wherever work at height equipment is used.

## 1.19 HOT WORK

- .1 Hot work means work involving open flame or that may produce an open flame such as riveting, welding, cutting, grinding, burning or heating.

Construction site Work must be carried out in compliance with Building Construction Operations standard FCC No. 301 – June 1982. The standard is available at:

[http://info.load-otea.hrdc-drhc.gc.ca/prevention\\_incendies/normes/normes.htm](http://info.load-otea.hrdc-drhc.gc.ca/prevention_incendies/normes/normes.htm)

A functional portable fire extinguisher must be available and easily accessible within 5 metres of all flame or source of sparks or intense heat.

A person must be designated to conduct a fire watch for a period of 30 minutes following the end of the work shift. The designated person must co-sign a permit and submit to the site supervisor (or designated person) at the end of the 30-minute period.

Storage of propane cylinders must comply with *CAN/CSA-B149.2-F00 – Propane Storage and Handling Code*, in addition to complying with specific conditions set forth in this document. Cylinders must be stored outdoors in a safe area preventing unauthorized handling, in a storage compartment designed for this purpose, solid, vertical and padlocked at all times in an area where there is no vehicle circulation unless protected with suitable barriers.

All cylinders used or stored on site must be equipped with device to protect nozzle.

It is forbidden to fill cylinders on site unless a procedure compliant with *CAN/CSA B149.2* has been approved and authorized by the PCA Representative.

- .2 Welding and cutting

Note: The following conditions in addition to the above must be met for welding and cutting operations.

Welding and cutting work must be carried out in compliance with sections 3.13 – Compressed gas supply and 3.14 – Welding and cutting of the Safety Code for the Construction Industry, *S-2.1, r.6*.

Construction site work must be carried in compliance with FCC No. 302, Standard for Welding and Cutting, May 1979. The standard is available at: [http://info.load-otea.hrdc-drhc.gc.ca/prevention\\_incendies/normes/302.shtml](http://info.load-otea.hrdc-drhc.gc.ca/prevention_incendies/normes/302.shtml).

Welding and cutting equipment represent an extremely hazardous fire risk on construction sites. The following precautions must be taken:

- .1 Store compressed gas cylinders on fire resistant surface in a well ventilated area.
- .2 Store all oxygen cylinders at a minimum distance of 6 metres from flammable gas (acetylene) or combustible such as oil or grease unless separated by a non-combustible partition as specified in section 3.13.4. of the Safety Code for the Construction Industry.
- .3 Use fire resistant tarps when welding work is superimposed or may cause sparks.
- .4 Store cylinders away from heat sources.
- .5 Do not place acetylene in contact with metals such as silver, mercury, copper, and brass alloys with more than 65% copper content to prevent risk of explosion.
- .6 Ensure arc welding equipment is suitably powered and grounded.
- .7 Ensure conductor wires of electric welding equipment are not damaged.
- .8 Place welding material on a flat surface protected from weather.

**1.19 HOT WORK (CONT'D)**

- .9 Remove or protect combustible materials that may be near the welding station.
- .10 Welding or cutting sealed containers is not allowed.
- .11 Provide for protective measures when welding or cutting is carried out near conduits, reservoirs or other receptacles containing flammable materials.
- .12 Welding or cutting with an open flame on a container containing a flammable or explosive substance unless:
  - .1 Air samples have been taken indicating that Work may be safely carried out; or
  - .2 Measures have been taken to ensure work safety.

**1.20 LIFTING**

- .1 Lifting devices must be positioned to avoid moving loads over workers, occupants or the general public.
- .2 The Contractor must submit to PCA Representative a work procedure signed and sealed by an Engineer, including the position of the lifting device, a sketch of the load trajectory, length of the boom and a lifting plan for loads lifted across occupied buildings. The PCA Representative if deemed necessary may require Work to be carried out in the evenings or weekends.
- .3 All equipment must be inspected prior to delivery to the Work site and a certificate attesting conformity forwarded by the Contractor to the PCA Representative.
- .4 The Contractor must submit the manufacturer's recommended procedure or a procedure signed and sealed by an Engineer for hoist installations. The procedure must describe maximum allowed loads, the number, weight and location of counterweights and elements that may affect capacity and stability of the equipment.
- .5 The mechanical inspection certificate, annual inspection certificate and logbook must be kept onboard cranes and crane trucks.
- .6 Lifting zones must be barricaded to prevent entry by unauthorized people.
- .7 The Contractor must obtain all permits and pay all costs involved in the temporary restriction of public circulation, if required under the previous paragraph or for any reason involving the safety of workers, occupants or the public.
- .8 The Contractor must meticulously inspect all slings and other lifting accessories and dispose of damaged materials.
- .9 Compressed gas cylinders must be lifted using equipment designed specifically for this purpose.

**PART 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**PART 3      EXECUTION**

**3.1            NOT USED.**

.1      Not used.

**END OF SECTION**



## **PARTIE 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

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

### **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 humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
  - .3 Canadian Environmental Protection Act (CEPA), (S.C. 1999, c. 33).
  - .4 Migratory Birds Convention Act, 1994 (S.C. 1994, c. 22).
  - .5 Species at Risk Act (S.C. 2002, c. 29).
  - .6 Historic Canals Regulations (P.C. 1993-891).
  - .7 Transportation of Dangerous Goods Act (TDGA), (1992, c. 34).
  - .8 Canadian Environmental Quality Guidelines (CCME, 1999).
  - .9 Canada-wide Standards for Petroleum Hydrocarbons (PHC) in Soil (CCME, 2008).
  - .10 Clean Air Regulation, (Q-2, r. 4.1).
  - .11 Regulation respecting hazardous materials, (Q-2, r. 32).
  - .12 Guidelines for Soil Protection and the Rehabilitation of Contaminated Sites.
  - .13 Regulation respecting solid waste, (Q-2, r. 13).
  - .14 Regulation respecting the landfilling and incineration of residual materials (Q-2, r. 19).
  - .15 Regulation respecting the burial of contaminated soils, (Q-2, r. 18).
  - .16 Regulation respecting contaminated soil storage and contaminated soil transfer stations, (Q-2, r. 46).
  - .17 Guidelines for Surface Water Quality (MDDELCC, 2015).
  - .18 Regulation no. 2008-47, Communauté métropolitaine de Montréal.

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

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by PCA Representative.
- .3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.



**13 ACTION AND INFORMATIONAL SUBMITTALS (cont'd)**

- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan.
  - .1 Refer to appended EPP.

**1.4 FIRES**

- .1 Fires and burning of rubbish on site is not permitted.
- .2 Provide supervision, attendance and fire protection measures as directed.

**1.5 DRAINAGE**

- .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include 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.
- .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 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .6 Ensure compliance with applicable discharge standards, i.e., CCME water quality guideline - protection of aquatic life, MELCC surface water quality criteria (protection of aquatic life - acute effect) and CMM Regulation 2008-47 for suspended solids, pH and C10-C50. The Contractor must demonstrate compliance with these standards. The Contractor must obtain permission from the Departmental Representative before proceeding with any release into the environment.

**1.6 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas designated by PCA Representative.
- .6 Remove vegetation outside of the migratory bird nesting season, which extends approximately from early April to late August.

**1.6 SITE CLEARING AND PLANT PROTECTION (cont'd)**

- .7 Do not use pesticides near water (within 3 m of the high water mark). If pesticides are required elsewhere on the work site, a pesticide treatment plan must be submitted for approval by Parks Canada.
- .8 Plant waste of invasive alien species must be appropriately placed in approved sites.
- .9 Manually prune vegetation near bodies of water and manually recover any plant debris that accidentally falls into the water.
- .10 Tree branches that may be damaged during construction must be protected or pruned.
- .11 In the case where trees are damaged during the work, provide a report from a forestry engineer including an assessment of the survival potential of the affected trees. If tree survival is affected by the damage, it must be replaced as directed by the Parks Canada Representative.

**1.7 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Prevent sanding materials and other foreign matter from contaminating air and waterways outside the application zone.
  - .1 Provide temporary enclosures where indicated by PCA Representative.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads. Use only water as a dust suppressant (no chemicals).
- .5 Clean streets neighbouring the site that were soiled during work carried out by the "Contractor" and subcontractors.

**1.8 NOTIFICATION**

- .1 PCA 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 PCA Representative of proposed corrective action and take such action for approval by PCA Representative.
  - .1 Take action only after receipt of written approval by PCA Representative.
- .3 PCA 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.

**1.9 ENVIRONMENTAL MITIGATION MEASURES**

- .1 Environmental mitigation measures to take into consideration during work are described in appendix 1.

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**PARTIE 2      PRODUCTS**

**2.1              NOT USED.**

- .1      Not used.

**PARTIE 3      EXECUTION**

**3.1              CLEANING**

- .1      Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1      Leave Work area clean at end of each day.
- .2      Bury rubbish and waste materials on site where directed after receipt of written approval from PCA Representative.
- .3      Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .4      Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCES**

- .1 Not used.

**1.3 INSPECTION**

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

**1.4 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by PCA Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by PCA Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by PCA Representative at no cost to PCA Representative. Pay costs for retesting and reinspection.

**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 PROCEDURE**

- .1 Notify appropriate agency and PCA 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 PCA 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 PCA 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 PCA Representative.

**1.8 REPORTS**

- .1 Submit one (1) electronic copie of inspection and test reports to PCA 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 PCA Representative 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 as specified in specific Section acceptable to PCA Representative.
- .3 Prepare mock-ups for PCA 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.

**1.10 MOCK-UPS (cont'd)**

- .5 If requested, PCA Representative will assist in preparing schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to PCA 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.

**PART 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not used.

**PART 3 EXECUTION**

**3.1 NOT USED.**

- .1 Not used.

**END OF SECTION**



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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 43 – Environmental Procedures.
- .2 Section 01 56 00 – Temporary Access and Protection.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1/A23.2-F04, Béton – Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA-0121-FM1978(C2003), Douglas Fir Plywood.
  - .3 CAN/CSA-S269.2-FM1987(C2003), Access Scaffolding for Construction Purposes.
- .2 Ministère des Transports, de la Mobilité durable et de l'Électrification des Transports
  - .1 Cahier de normalisation Tomes Signalisation routière, most recent edition.
- .3 Commission des normes et d'équité, de la santé et de la sécurité au travail (CNESST).
  - .1 Law, regulations and standards.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4 INSTALLATION AND REMOVAL**

- .1 Prior to commencing work, prepare, for approval of PCA Representative, site plan indicating proposed location and dimensions of areas to be fenced and used by Contractor, number of trailers, access to fenced in area and fencing details.
- .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.
- .6 Disconnect and dismantle temporary power network.
- .7 Restore site to preconstruction state in compliance with PCA Representative's onsite instructions.

**1.5 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide scaffoldings, access ramps, ladders, swing stagings, platforms, temporary stairs and all hoisting equipments necessary to the execution of the works, and ensure their maintenance.



## **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 operators.

## **1.7 SITE STORAGE/LOADING**

- .1 Provide outdoor storage plan for materials including granular, stones, conduits and other and have approved by PCA Representative.
- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

## **1.8 CONSTRUCTION PARKING**

- .1 Parking will be permitted on the storage site provided it does not disrupt traffic and performance of Work.
- .2 Provide and maintain adequate access ways to project site and ensure maintenance.
- .3 Provide access signs in accordance with Ministère des Transports requirements.
- .4 Clean trail and streets daily on site equipment use.

## **1.9 SECURITY MEASURES**

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

## **1.10 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 lay down table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.

## **1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE**

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

**1.12 SANITARY FACILITIES**

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

**1.13 CONSTRUCTION SIGNAGE**

- .1 No other signs or advertisements, other than warning signs, are permitted on site.
- .2 Provide writing on signs and security notices in both official languages, and graphic symbols to CAN/CSA-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by PCA Representative.
- .4 Provide access and temporary relocated roads as necessary to maintain traffic.
- .5 Maintain and protect traffic on affected roads during construction period. No modification to traffic can be done without prior authorization of PCA Representative.

**1.14 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 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.
- .2 Protect travelling public from damage to person and property.
- .3 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .4 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: is responsible for repair of damages to roads caused by construction operations.
- .5 Construct access and haul roads necessary.
- .6 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: adequate to ensure safe operation at all times.
- .9 Location, grade, width, and alignment of construction and hauling roads: subject to approval by PCA Representative.
- .10 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .11 Provide snow removal during period of Work.
- .12 Remove, upon completion of work, haul roads designated by PCA Representative.

**1.15 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 Do not stack in construction facilities stored new or salvaged material.

**PART 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not Used.

**PART 3 EXECUTION**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

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

**END OF SECTION**

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**PARTIE 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 51 00 - Temporary Utilities.
- .2 Section 01 74 21 - Construction Demolition Waste Management and Disposal.

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  - .2 CAN/CGSB 1.189 00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-O121-FM1978(C2003), Douglas Fir Plywood.
- .1 Ministère des Transports
  - .1 Cahier de normalisation Tomes Signalisation routière, last édition.

**1.3 INSTALLATION AND REMOVAL**

- .1 Provide, put in place or develop temporary accesses and protections works in order to execute the Works expeditiously.
- .2 Remove from site all such work after use.

**1.4 PALISADES**

- .1 Erect around the site temporary site enclosures consisting of 2.40 metre, approved by the PCA Representative. Install locking access barrier to construction site. The Contractor must install information panels provided by the PCA Representative on the fence.
- .2 Install fences around trees and vegetation to protect them from damage caused by construction material or operations.
- .3 Fence in excavation not backfilled at the end of the work day to the satisfaction of the Departmental Representative.

**1.5 GUARD RAILS AND BARRICADES**

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

**1.6 ACCESS TO SITE**

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

**1.7 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators and necessary devices required to perform Work and protect public in compliance with Volume V of the Québec Road safety code.

**1.8 FIRE ROUTES**

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

**1.9 PROTECTION FOR NEIGHBOURING PRIVATE AND PUBLIC PROPERTIES**

- .1 Protect surrounding private and public properties from any damages that could occur as a result from performance of Work.
- .2 As case may occur, assume entire responsibility for caused damages.

**1.10 WASTE MANAGEMENT AND DISPOSAL**

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

**PARTIE 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**PARTIE 3 EXÉCUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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## **PARTIE 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Not used.

### **1.2 REFERENCES**

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

### **1.3 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

### **1.4 AVAILABILITY**

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

#### **1.4 AVAILABILITY (cont'd)**

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

#### **1.5 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

#### **1.6 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Departmental Representative will pay costs of transportation for materials provided by Master Contractor. Ensure unloading, handling and storage of products.

#### **1.7 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

## **1.8 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative whose decision is final.

## **1.9 COORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

## **1.10 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

## **1.11 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

## **1.12 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.



**1.12 FASTENINGS – EQUIPMENT (cont'd)**

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

**1.13 PROTECTION OF WORK IN PROGRESS**

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

**1.14 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**PARTIE 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**PARTIE 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCES**

- .1 PCA Representative's documents indicating property boundaries and existing survey reference points.

**1.3 QUALIFICATIONS OF SURVEYOR**

- .1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to PCA Representative.

**1.4 SURVEY REFERENCE POINTS**

- .1 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .2 Make no changes or relocations without prior written notice to PCA Representative.
- .3 Report to PCA Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .4 Require surveyor to replace control points in accordance with original survey control.
- .5 AutoCAD drawings are available to Contractor to establish electronic staking logs

**1.5 SURVEY REQUIREMENTS**

- .1 Establish two (2) permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading, fill and topsoil placement and landscaping features.
- .4 Stake slopes and berms.
- .5 Establish pipe invert elevations.
- .6 Stake batter boards for foundations.
- .7 Establish lines and levels for systems and mechanical and electrical installations.

### **1.5 SURVEY REQUIREMENTS (cont'd)**

- .8 The Contractor shall implement on site, using survey stakes, each project elements while checking their location indicated in the plans and reporting, if applicable, any discrepancy or inconsistency between the possible and the actual values indicated in the plans. The position of each element must be validated on site after picketing by the PCA Representative. In addition, the Contractor shall provide the representative of the Ministry GPS tracking items once implanted picket for design validation. Nothing needs to be installed without the approval of the PCA Representative following the interventions mentioned above.
- .9 The Contractor shall provide an analysis within 48 hours by the PCA Representative after making picketing and send GPS coordinates for approval. In addition, the Contractor shall validate the final picket by the Representative of the Ministry before work

### **1.6 EXISTING SERVICES**

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify PCA Representative of findings.

### **1.7 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform PCA Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by PCA Representative.

### **1.8 RECORDS**

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

### **1.9 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit name and address of Surveyor to PCA Representative.
- .2 On request of PCA Representative submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

**1.10 SUBSURFACE CONDITIONS**

- .1 Promptly notify PCA Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should PCA Representative determine that conditions do differ materially; instructions will be issued for changes in Work as provided in Changes and Change Orders.

**PART 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not Used.

**PART 3 EXECUTION**

**3.1 NOT USED.**

- .1 Not Used.

**END OF SECTION**



**PARTIE 1      GENERAL**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**1.2            REFERENCES**

- .1      Not used.

**1.3            PROJECT CLEANLINESS**

- .1      Maintain Work in tidy condition, free from accumulation of waste products and debris, including 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      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4      Provide on-site containers for collection of waste materials and debris.
- .5      Provide and use marked separate bins for recycling.
- .6      Dispose of waste materials and debris off site.
- .7      Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8      Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9      Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10     Clean and sweep public areas used for site as required and every day if necessary.

**1.4            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 products and debris including that caused by Owner or other Contractors.
- .5      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.

**1.4 FINAL CLEANING (cont'd)**

- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors, ceilings and any other finished work.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .9 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .10 Remove dirt and other disfiguration from exterior surfaces.
- .11 Sweep and wash clean paved areas.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

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

**1.6 SNOW REMOVAL**

- .1 Snow removed during snow removal operations must not be disposed of in the canal, in accordance with the Historic Canal Regulation.

**PARTIE 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**PARTIE 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**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 Not used.

**1.3 WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work conduct meeting with PCA Representative to review waste management goal and Contractor's proposed Waste Reduction Work plan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 Waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide PCA Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .4 Protect environment and prevent environmental pollution damage.

**1.4 DEFINITIONS**

- .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the PCA Representative.
- .2 Class III: non-hazardous waste - construction renovation and demolition waste.
- .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities.
- .4 Cost/Revenue Analysis Workplan (CRAW): based on information from Waste Reduction Workplan, and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).
- .5 Inert Fill: inert waste - exclusively asphalt and concrete.
- .6 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
- .7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.



## **1.2 DEFINITIONS (cont'd)**

- .9 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .10 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2 Returning reusable items including pallets or unused products to vendors.
- .11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .12 Separate Condition: refers to waste sorted into individual types.
- .13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
- .15 Waste Reduction Work plan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities.
- .16 References:
  - .1 Public Works and Government Services Canada (PWGSC):
    - .1 2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.
    - .2 CRD Waste Management Market Research Report (available from PWGSC's Environmental Services).

## **1.5 WASTE SOURCE SEPARATION PROGRAM (WSSP)**

- .1 As part of Waste Reduction Work plan, prepare WSSP prior to project start-up.
- .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.
- .3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .5 Locate containers to facilitate deposit of materials without hindering daily operations.
- .6 Provide training for sub-contractors and workers in handling and separation of materials for reuse and/or recycling.
- .7 Locate separated materials in areas which minimize material damage.
- .8 Clearly and securely label containers to identify types/conditions of materials accepted.

### **1.3 WASTE SOURCE SEPARATION PROGRAM (WSSP) (cont'd)**

- .9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.
- .10 On-site sale of salvaged materials is not permitted unless authorized in writing by PCA Representative and provided that site safety regulations and security requirements are adhered to.
- .11 Objectives for trees to be cut down are as follows (calibre and/or species, percentage of reuse, suggested percentage):
  - .1 Trees and branches under 15 cm in diameter: 100% mulch disposed offsite or wood chips can be extended into the surrounding forest woodland owned by Parks Canada.
  - .2 Deciduous trees under 30 cm in diameter: 100% firewood, carpentry.
  - .3 Coniferous trees under 20 cm in diameter 100% mulch disposed offsite or wood chips can be extended into the surrounding forest woodland owned by Parks Canada.
  - .4 Coniferous trees over 30 cm in diameter: 100% lumber.
  - .5 Hardwood (maple, birch, ash, oak) over 30 cm in diameter: 100% carpentry, lumber, firewood.
  - .6 Deciduous trees (elm, ironwood, poplar, apple, honeysuckle, other): 100% carpentry, firewood.
  - .7 Sick trees: 100% must be removed from site and burned.

The Contractor shall provide a report at the end of work specifying the number of dependent cord of wood, the number of PPM lumber and wood veneer from activities related to the work.

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

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by PCA Representative.

### **1.7 WASTE PROCESSING SITES**

- .1 Provide PCA Representative with list and details of waste treatment facilities where waste will be transported to.
- .2 All waste and demolition materials belong to the Contractor. Salvaged materials are to be transported off site at Contractor's expense to facilities authorized by MTQ.

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

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by PCA Representative
- .2 Unless specified otherwise, materials for removal do not become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.

## **1.6 STORAGE, HANDLING AND PROTECTION (cont'd)**

- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify PCA Representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .9 Separate and store materials produced during project in designated areas.
- .10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to offsite processing facility for separation.
  - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
  - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

## **1.9 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 Keep records of construction waste including.
  - .1 Number and size of bins.
  - .2 Waste type of each bin.
  - .3 Total tonnage of waste generated.
  - .4 Total tonnage of waste reused or recycled.
  - .5 Reused or recycled waste destination.
- .4 Remove materials on-site as Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

## **1.10 SCHEDULING**

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

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**PART 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not Used.

**PART 3 EXECUTION**

**3.1 GENERAL**

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

**3.2 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 or recycling.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .2 Source separate materials to be reused/recycled into specified sort areas.

**3.3 DIVERSION OF MATERIALS**

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by PCA Representative and consistent with applicable fire regulations.
  - .1 Mark containers or stockpile areas.
  - .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged, recovered, reusable and recyclable materials is not permitted.

**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 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor must conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1 Notify PCA Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2 Request PCA Representative inspection.
  - .2 PCA Representative Inspection:
    - .1 PCA 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 English and 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 balanced and fully operational.
    - .4 Training given to designated personnel on operation of equipment, systems and materials.
    - .5 Commissioning of electrical equipment and systems and Final Commissioning report submitted to PCA Representative.
  - .4 Work: complete and ready for final inspection.
  - .5 Final Inspection:
    - .1 When completion tasks are done, request final inspection of PCA Representative which will be held jointly with the contractor.
    - .2 When Work is incomplete according to PCA Representative, complete outstanding items and request re-inspection.
  - .6 Declaration of Substantial Performance: when PCA Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .7 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.

**1.2 ADMINISTRATIVE REQUIREMENTS (cont'd)**

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

**1.3 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling]in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**PART 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 31 19 – Project meetings

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting two (2) weeks prior to contract completion with contractor's representative and PCA Representative in accordance with Section 01 31 19 - Project Meetings to:
    - .1 Verify Project requirements.
    - .2 Review warranty requirements and manufacturer's installation instructions.
  - .2 PCA 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, telephone 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.
- .1 Two (2) weeks prior to Substantial Performance of the Work, submit to the PCA Representative, one (1) copy of the digital documents of operating and maintenance manuals in English and French.
- .2 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .3 Provide evidence, if requested, for type, source and quality of products supplied.

**1.4 FORMAT**

- .1 Organize data as digital instructional manual.
- .2 Group the data according to a defined table of contents.
- .3 Arrange content under Specifications Section numbers and sequence of Table of Contents.
- .4 Provide, for each product and each system, a separator on which, with typed description of product and major component parts of equipment.
- .5 The text must consist of data provided by the manufacturers
- .6 Provide scaled CAD files in dwg format.



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

- .1 Table of Contents: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses and telephone numbers of PCA Representative and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to 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 Texts: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

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

- .1 Maintain, at site for PCA 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.
- .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 PCA Representative.

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

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by PCA 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.
  - .1 Field changes of dimension and detail.
  - .2 Changes made by change orders.
  - .3 Details not on original Contract Drawings.
  - .4 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.

## **1.8 FINAL SURVEY**

- .1 Submit to the PCA Representative the final plan survey, issued "As Built" (DWG), certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

## **1.9 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.

**1.9 EQUIPMENT AND SYSTEMS (cont'd)**

- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
  - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
  - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Include manufacturer's printed operation and maintenance instructions.
- .7 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .8 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .9 Additional requirements: as specified in individual specification sections.

**1.10 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 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.

**1.11 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to PCA Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
    - .1 Provide items of same manufacture and quality as items in Work.
    - .2 Deliver to location as directed; place and store.

**1.11 MAINTENANCE MATERIALS (cont'd)**

- .3 Receive and catalogue items.
  - .1 Submit inventory listing to PCA Representative.
  - .2 Include approved listings in Maintenance Manual.
- .4 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to PCA Representative.
    - .2 Include approved listings in Maintenance Manual.

**1.12 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 PCA Representative.

**1.13 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to PCA Representative for approval.
- .3 Warranty management plan to include required actions and documents to assure that PCA Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to PCA Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in digital binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond separate each guarantee and bond identified according to the contents of the table of contents
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of work.

**1.13 WARRANTIES AND BONDS (cont'd)**

- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct four (4) month and nine (9) month joint warranty inspection, measured from time of acceptance, with PCA Representative.
- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, commissioned systems, fire protection systems, alarm systems, sprinkler systems, lightning protection systems.
  - .3 Provide list for each warranted equipment, item, and feature of construction or system indicating:
    - .1 Name of item, system or lot.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one (1) year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .4 Contractor's plans for attendance at nine (9) month post-construction warranty inspections.
  - .5 Procedure and status of tagging of equipment covered by extended warranties.
  - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

**1.13 WARRANTIES AND BONDS (cont'd)**

- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions:
  - .1 Failure to respond will be cause for the PCA Representative to proceed with action against Contractor.

**PART 2 PRODUCTS**

**2.1 NOT USED.**

- .1 Not Used.

**PART 3 EXECUTION**

**3.1 NOT USED.**

- .1 Not Used.

**END OF SECTION**



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**PART 1      GENERAL**

**1.1      RELATED REQUIREMENTS**

- .1      Section 01 32 16.07 - Construction Progress Schedule (Gantt)
- .2      Section 01 35 43 - Environmental Procedures
- .3      Section 01 74 11 - Cleaning
- .4      Section 31 23 33.01 - Excavating, Trenching and Backfilling

**1.2      REFERENCES**

- .1      Definitions:
  - .1      Demolition: rapid destruction of building following removal of hazardous materials.
  - .2      Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
  - .3      Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.
    - .1      Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
    - .2      Indicates quantities of reuse, recycling and landfill.
  - .4      Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
  - .5      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      Canadian Council of Ministers of the Environment (CCME)
  - .2      Department of Justice Canada (Jus)
    - .1      Canadian Environmental Assessment Act.
    - .2      Canadian Environmental Protection Act.
  - .3      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
    - .1      Material Safety Data Sheets (MSDS).
  - .4      Transports Canada (TC)
    - .1      Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.



### **1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Site Meetings:
  - .1 Convene pre-demolition meeting one week prior to beginning work of this Section 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 to:
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building subtrades.
  - .2 Arrange for site visit with PCA Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.
  - .3 Ensure key personnel, site supervisor, project manager, subcontractor representatives and WMC attend.
  - .4 Reporting Requirements: WMC to complete.
  - .5 WMC must provide written report on status of waste diversion activity at each meeting.
- .2 Scheduling: meet project time lines without compromising specified minimum rates of material diversion.
  - .1 Notify PCA Representative in writing when unforeseen delays occur.
- .3 Health and safety:
  - .1 Comply with occupational health and safety construction regulations in accordance with Section 01 35 29 – Health and Safety.

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

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.
- .3 Hazardous Materials:
  - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .4 Waste Reduction Plan:
  - .1 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate.
    - .1 Descriptions of and anticipated quantities of materials to be salvaged reused, recycled and landfilled.
    - .2 Schedule of selective demolition.
    - .3 Number and location of dumpsters.
    - .4 Anticipated frequency of tippage.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS (cont'd)**

- .5 Certificates:
  - .1 Submit copies of certified weigh bills from authorized disposal sites and reuse and recycling facilities for material removed from site.
  - .2 Written authorization from PCA Representative is required to deviate from facilities listed in Waste Reduction Workplan.

**1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEEA, TDGA, applicable Provincial/Territorial regulations.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Entrepotage and protection
  - .1 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
  - .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of PCA Representative and at no cost to PCA Representative.
  - .3 Remove and store materials to be salvaged, in manner to prevent damage.
  - .4 Store and protect in accordance with requirements for maximum preservation of material.
  - .5 Handle salvaged materials as new materials.

**1.7 SITE CONDITIONS**

- .1 Site Environmental Requirements.
  - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
  - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
  - .3 Do not dispose of waste of 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 the project.
  - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
  - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities and as directed by PCA Representative.
  - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.

## **1.7 SITE CONDITIONS (cont'd)**

- .2 Existing Conditions:
  - .1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements.

## **1.8 SUMMARY**

- .1 To be demolished (non exhaustive list):
  - .1 Concrete surface, foundations, with granular foundation.
  - .2 Small concrete walls with and without posts and chains.
  - .3 Stone dust surface, with granular base.
  - .4 Concrete bases for furniture.
  - .5 Handrail sections.
  - .6 Bollards / PE guards, with concrete bases.
  - .7 Guardrail/ safety barrier including wood posts, bases, supports and anchors.
  - .8 Wood barrier.
- .2 To be removed and relocated (non-exhaustive list):
  - .1 Traffic signs.
  - .2 Interpretation panels.
  - .3 Furniture: wood benches.
  - .4 Stones / Rocks.
- .3 To be removed and delivered to PCA Representative (non exhaustive list):
  - .1 Traffic signs.
  - .2 Furniture: Benches, garbage bins, bike racks.
  - .3 Concrete bumpers.
  - .4 Handrail sections.
  - .5 Access barrier.
  - .6 Concrete/steel bollards.
  - .7 Lamp posts.
- .4 The PCA Representative may wish to recuperate all other demolished items not indicated on the list or indicate to the Contractor items not recuperated and to be removed from the site.
- .5 The PCA Representative will indicate to the Contractor where the materials and equipment are to be delivered.

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**PART 2 PRODUCTS**

**2.1 EQUIPMENT**

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

**PART 3 EXECUTION**

**3.1 PREPARATION**

- .1 Inspect site with PCA Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

**3.2 REMOVAL OF HAZARDOUS WASTES**

- .1 Remove contaminated or dangerous materials 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.
- .2 Remove items as indicated.
- .3 Do not disturb items designated to remain in place.
- .4 Removal of pavements, curbs and gutters:
  - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by PCA Representative.
  - .2 Protect adjacent joints and load transfer devices.
  - .3 Protect underlying and adjacent granular materials.
  - .4 Cut granite edging where there are transition and changes in elevation.
- .5 To remove pipes buried under existing pavement, dig to a minimum depth of 300 mm beneath pipe invert.
- .6 Remove as many trees and shrubs designated on site by PCA Representative during demolition.
  - .1 Obtain written approval of PCA Representative prior to removal of trees and shrubs not designated.
- .7 Sell, donate, or dispose of trees to be healthy and marketable.
  - .1 Grind, chip, or shred other vegetation for mulching and composting, or use as mill pulp or process fuel.
- .8 Stockpile topsoil for final grading and landscaping:
  - .1 Provide erosion control and seeding if not immediately used.
- .9 Salvage:
  - .1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.

### **3.2 REMOVAL OF HAZARDOUS WASTES (cont'd)**

- .10 Disposal:
  - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan as instructed by PCA Representative.
  - .2 Trim disposal areas to approval of PCA Representative.
- .11 Backfill:
  - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **3.3 STOCKPILING**

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

### **3.4 REMOVAL FROM SITE**

- .1 Remove stockpiled material as directed by PCA Representative, when it interferes with operations of project.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .3 Transport material designated for alternate disposal using approved haulers, facilities, receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
  - .1 Disposal Facilities: approved and listed in Waste Reduction Workplan.
  - .2 Written authorization from PCA Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

### **3.5 RESTORATION**

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work and to match condition of adjacent, undisturbed areas.
- .2 Restore areas designated by PCA Representative used for site access, storage, office trailers and parking.
- .3 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

**3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
  - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.7 PROTECTION**

- .1 Repair damage to adjacent materials or property caused by selective site demolition.
- .2 Adequately protect work and equipment near work site.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 All sections included in Division 01 - General Requirements and 02 – Existing conditions.
- .2 Section 03 10 00 – Concrete forming and accessories
- .3 Section 03 20 00 – Concrete reinforcing
- .4 Section 03 30 00 – Cast-in-place concrete
- .5 Despite previous enumeration, the Contractor shall obtain a copy of all sections of this specification even if they do not seem relevant to his specialty. The Contractor acknowledges implicitly that he accepts the clauses and prescriptions of all sections of the current specification, even if he fails to consult certain sections. Refer to the table of contents for a complete list of sections.

**1.2 REFERENCES**

- .1 Unless otherwise indicated, the latest publication and amendments of the following standards prevail on the effective date of the contract.
  - .2 CSA International :
    - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    - .1 CAN/CSA A3000-F13, Cementitious material compendium (contains A3001, A3002, A3003, A3004 and A3005).
    - .2 CAN/CSA – S448.1-10 (R2015), Repair of reinforced concrete in buildings and parking structures.
  - .3 Ministère des Transports (MTQ) :
    - .1 Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (« CCDG 2019 »).
  - .4 American Concrete Institute:
    - .1 ACI 224.1-R07 (1998), Causes, Evaluation and Repair of Cracks in Concrete Structures
    - .2 ACI 304.2R-96 (2008), Placing Concrete by Pumping Methods.
    - .3 ACI 117, Standard Tolerances for Concrete Construction and Materials
    - .4 ACI 503.1, Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive.
    - .5 ACI 503.2, Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive.
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- .6 ACI 503.3, Standard Specification for Producing a Skid-Resistant Surface on Concrete by the Use of Epoxy and Aggregate.
- .7 ACI 503.4, Standard Specification for Repairing Concrete with Epoxy Mortars.
- .8 ACI 546R-14, Guide to Concrete Repair
- .9 ACI 562-13, Code requirements for Evaluation, Repair and Rehabilitation of concrete Buildings
- .5 International Concrete Repair Institute (ICRI):
  - .1 Technical Guideline No. 310.1R, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
- .6 ASTM International
  - .1 ASTM E488/E488M-15, Standard Test Methods for Strength of Anchors in Concrete Elements.

### **1.3 DEFINITIONS**

- .7 Sound concrete: Concrete whose constituents are still firmly connected to each other. Concrete that does not crumble by scraping with a metal tool or under the action of a jet of air or water under a pressure of 700 kPa.
- .8 Delaminated concrete: Concrete that has one or more cleavage planes at the level of the reinforcement layers while remaining precariously in its original position.
- .9 Spalling concrete : Concrete that is completely detached and not in adherence with the original structure. Concrete surface failure caused by the concrete bursting.

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

- .10 Submit to PCA Representative, in accordance with Section 01 33 00 - Submittal Procedures, at least ten days before work starts.

### **1.5 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with section 01 45 00 – Quality Control.
  - .2 Chemical anchors:
    - .1 Prior to chemical anchors installation, install three (3) studs or anchor rods into holes drilled with epoxy resin adhesive, as recommended by the products manufacturer, where appointed by the PCA Representative. This test shall be performed by the Contractor for each structural element requiring the placement of chemical anchors.
    - .2 Perform pull-out tests on these studs or anchor rods in accordance with ASTM E488 in the presence of the PCA Representative.
    - .3 If the pull-out capacity of the studs or anchor rods is less than the yield strength of the materials as indicated on the drawings or data sheets, modify the anchoring method and repeat the pull-out tests on new anchors.
    - .4 Repair all damaged concrete surfaces during tear-off tests.
-

- .3 Qualifications: Applicators of products specific to concrete repairs must demonstrate that they have practical experience in placing materials approved by the PCA representative. They must be qualified under the applicable standards in effect.
- .4 Manufacturers of Products: The manufactured products to be used for the concrete repair must come from a single manufacturer with at least 10 years of experience in the distribution of such products and who has a recognized technical support service.

## **1.6 ON-SITE CONDITIONS**

- .1 Canal level will be lowered during repairs. The Contractor shall ensure that the work area is prepared to accommodate demolition, placement of repair materials, curing and hardening of materials. The means used by the Contractor such as cofferdams, sandbags and pumps or other equipment to dry the work area shall be approved in advance by the PCA Representative. Maintain equipment ready for weather conditions that will quickly increase water infiltration.
- .2 The Contractor must take into account that he will have to demolish sound elements to carry out the work.
- .3 Perform work in accordance with applicable laws, codes, standards and regulations of the appropriate authorities.
- .4 The Contractor shall take strict measures to ensure that no material, product, debris or other object causes harm to the environment and to others and to hold the PCA Representative harmless in all proceedings, claims loss or damage inherent and consequential to its default.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Portland cement: general purpose, CAN / CSA A3000 type GU or GUB.
  - .2 Water: according to CSA A23.1.
  - .3 Aggregates: CSA A23.1 / A23.2 and granitic.
  - .4 Refurbishment concrete: in accordance with Section "03 30 00 - Cast-in-place concrete".
  - .5 Unmixed Dry Grout: a product containing Portland cement based on non-metallic aggregates and sufficient water to maintain its shape when pelletized with the hands and capable of achieving a compressive strength of 35 MPa. at 28 days.
  - .6 Chemical anchor system: in accordance with Section 03 10 00 - Formwork and Concrete Accessories.
  - .7 Chemical anchoring:
    - .1 Use two-component injectable adhesive for installation of all reinforcing steel studs in existing concrete.
-

- .2 Minimum compressive strength: 50 MPa.
- .8 Products must be less than 12 months old.
- .9 Deliver products in their original packaging with date of manufacture.

## **2.2 EQUIPEMENT**

- .1 Authorized demolition equipment:
  - .1 Demolition of concrete within 450 mm of existing elements to be retained or reinstalled:
    - .1 Hammer type: pneumatic or manual
    - .2 Maximum mass: 7 kg
    - .3 Hammer point: spade
  - .2 Demolition of other concrete:
    - .1 Hammer type: pneumatic or manual
    - .2 Maximum mass: 15 kg
- .2 Material of chemical anchors:
  - .1 Use only dispensers and mixing nozzles recommended by the manufacturer.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- .1 Prior to the beginning of Work, the PCA Representative will identify and demarcate, in the presence of the Contractor, the concrete areas to be demolished.
- .2 Provide the PCA Representative with the necessary security equipment to safely perform surveys to determine, in conjunction with the Contractor, the surfaces to be demolished and to conduct checks on affected surfaces.

### **3.2 DEMOLITION**

- .1 Take all necessary precautions not to damage the concrete parts to be preserved during the demolition work of the delaminated or spalling concrete. For this purpose, use manual or pneumatic hammers with a maximum weight of 7 Kg within 450mm of the peripheral limits of the area to be demolished.
  - .2 Prior to beginning of work, provide PCA Representative with technical data sheet of equipment to be used as well as proposed protective measures.
  - .3 Before starting concrete breaking, demolition or removal, and for all demolition categories, make a 20mm deep saw cut all around the surface to be demolished to delimit the area. Take all necessary precautions so that the saw kerf, on the perimeter of the demolition, does not reach the reinforcements.
-

- .4 If, due to lack of care, the existing reinforcement bars to be preserved and protected are damaged and can no longer play their structural role, they must be replaced, following the PCA Representative's instructions, at the expense of the contractor.
- .5 Remove all traces of corrosion on the reinforcements to be preserved and clean the concrete and reinforcement demolished on the surface by wet sandblasting or high-pressure water jet. This cleaning should allow to remove small pieces of concrete that no longer adhere perfectly to the surface and to obtain a rough surface for better adhesion to the new concrete.
- .6 Final cleaning of demolished surfaces with a jet of water pressure equivalent to 500 kPa at 450 mm from the nozzle shall be performed. The PCA Representative will review the condition of the remaining concrete to ensure that there are no moving parts, that the demolition has been performed in accordance with good practice, and that surfaces are acceptable for concrete pouring.

### **3.3 SURFACE PREPARATION**

- .1 Perform surface preparation in accordance with standards described in subsection 1.2 - REFERENCES of this section.
- .2 Surfaces to be repaired shall be clean and free from loose and friable particles.
- .3 Surfaces to be repaired must be approved by PCA Representative prior to commencement of concrete work.
- .4 Keep the surfaces wet for at least eight (8) hours before concrete pour and remove all puddles. The surfaces will be damps (saturated surface dry) before concreting.

### **3.4 INSTALLATION / APPLICATION**

- .1 Provide ready-mix concrete, manufactured in a concrete plant, transported and unloaded on site in accordance with Section 18 of CAN / CSA-A23.1.
  - .2 Require the concrete supplier a delivery slip for each concrete load and provide a copy of this slip to the PCA Representative. The following information will appear on the slip:
    - .1 Supplier's name and address
    - .2 Truck number
    - .3 Contractor's name
    - .4 Designation and location of the project
    - .5 Concrete class
    - .6 Cumulative Quantity
    - .7 Unloading start
    - .8 Unloading end
    - .9 Maximum aggregate size
    - .10 Entrained Air Required
    - .11 Types of adjuvants used
    - .12 Quantity and type of cement
-

- .13 Quantity of water.
- .3 Follow section 20 of CAN / CSA-A23.1 for construction joints.
- .4 Provide key construction joints full length to a depth of one-sixth of this thickness with a maximum of 100 mm. Bevel the sides of the keys slightly.
- .5 Also refer to section 03 30 00 – Cast-in-place concrete.

### **3.5 FINISHING AND CURING**

- .1 Protect and cure concrete in accordance with Clause 21 of CAN / CSA A23.1. In cold weather, protect the concrete in accordance with the requirements of CCDG 2019. The use of curing agents is prohibited.
- .2 Finishing of form surfaces:
  - .1 Finish form surfaces in accordance with Section 24 of CAN / CSAA23.1.
  - .2 Fill holes left by formwork tie rods with non-shrink mortar. Fill only the hole, without staining the surrounding surface.

### **3.6 NEW CONCRETE REPAIRS**

- .1 Check adhesion of repair concrete to existing concrete by striking surface with mason or geologist hammer. A hollow sound indicates a lack of adhesion and requires repair in the deficient area.
- .2 Remove and replace any damaged or defective concrete with concrete that meets drawings requirements and specifications, as directed by the PCA Representative.
- .3 Correct surfaces and remove concrete burrs around perimeter of repaired area.
- .4 After formwork removal, voids, honeycombs and other defects will be examined by the PCA Representative. Submit to the PCA Representative for approval of repair methods for voids, honeycombs or other defects where applicable. Do not make any surface corrections until authorized by the PCA Representative.
- .5 Concrete repair methods employed by the Contractor shall have prior approval from the PCA Representative. For repair work or repair of concrete without extra thickness, the Contractor must use cast-in-place concrete.
- .6 Refer to Section 03 30 00 - Cast-in-place concrete for concrete requirements and requirements.

### **3.7 CHEMICAL ANCHORS**

- .1 Drill holes at depths required by chemical anchor adhesive manufacturer to develop strength equivalent to  $1.25 * F_y$  and for concrete of 35 MPa.
  - .2 Minimum depth of the holes: 200 mm.
  - .3 Drill holes on vertical faces inclined at 15 ° horizontally down from the hole.
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- .4 Drill and clean holes according to manufacturer's instructions for selected chemical anchor system.
- .5 Inject adhesive from chemical anchors according to manufacturer's instructions for selected chemical anchor system.
- .6 Insert a clean stud free of grease to the bottom of the hole.
- .7 Prevent disturbance of the stud during the setting period.
- .8 Comply with Section 03 10 00 - Concrete Forms and Accessories for requirements and requirements for chemical anchors.

### **3.8 COLD WEATHER CONCRETING**

- .1 Some concrete work may be done in cold weather and may require shelter, heating or thermal insulation.
  - .2 The temperature of plastic concrete at the time of installation must comply with the requirements of MTQ 3101 standard.
  - .3 Provide shelter heating to comply with this section and CSA A23.1 / A23.2 requirements for material temperatures during concreting, concrete constituents, and temperature during the cure of the concrete.
  - .4 Maintain a minimum temperature of 10 ° C for a minimum period of seven (7) consecutive days following concreting.
    - .1 Extend the protection period until the concrete has reached 70% of the required compressive strength at twenty-eight (28) days.
  - .5 After the protection period, gradually lower the concrete temperature during the first twenty-four (24) hours.
    - .1 Temperature decrease rate must not be greater than 10 ° C / hour.
    - .2 Do not put concrete in contact with outside air if the temperature difference between the concrete and the outside air is greater than 20 ° C.
  - .6 Concrete cure requirements apply regardless of the type of protection installed.
  - .7 The part of the structure built with concrete that has frozen is considered defective and must be rebuilt according to drawings and specifications at the expense of the Contractor.
  - .8 The use of sodium chloride or calcium as a de-icing agent is prohibited.
  - .9 In the case of free-standing concrete, heat all surfaces (existing concrete, reinforcement, formwork, etc.) with which the plastic concrete comes in contact prior to a minimum temperature of 5 ° C.
  - .10 In the case of concreting carried out under shelter, heat and maintain at a temperature between 5 ° C and 20 ° C the contact surfaces for a period of at least 24 hours before concreting.
-

- .11 Keep the forms in place for the protection duration and maintain the form surfaces at a temperature between 10 ° C and 20 ° C for the duration of the protection.
- .12 Types of protection:
  - .1 Insulation:
    - .1 Use insulating material to cover plastic concrete surface.
      - .1 Each layer of insulating material shall be a watertight cover type made from closed cell foam board and have an RSI thermal resistance of 0.40.
    - .2 The day before concreting, have the PCA Representative approve the number of layers of insulating material to be laid.
      - .1 Depending on the evolution of the concrete temperature during the protection period, the PCA Representative may require reducing or increasing the number of layers; the removal or addition of a layer must be done within three (3) hours of the request of the PCA Representative.
    - .3 Ensure that the insulation is laid in such a way that it prevents any exposure of the concrete surfaces to outside air for the duration of the protection.
    - .4 Insulating covers shall have an overlap of at least 75 mm.
  - .2 Temporary shelter:
    - .1 Construct protective shelters that enclose structures.
    - .2 At least two (2) weeks before the start of concrete work under protective shelters, prepare and submit the Plan of realization of these shelters.
    - .3 Make the shelter to cover the surfaces of the concrete work with canvas and tarpaulins.
    - .4 These covers must be watertight, resistant and fixed so as not to be displaced during the period of protection.
    - .5 Ensure shelter is of sufficient height and size to accommodate interior, concrete placement, concrete finish and curing.
  - .3 Heating:
    - .1 Ensure that heating appliances such as kettles, heaters, etc., are of sufficient capacity and number to maintain concrete at the required temperature. A stream of hot air must circulate inside the shelter. The heat must reach all surfaces, whether they are protected with formwork or not.
    - .2 Ventilate protective shelter properly during heating period.
    - .3 Place heaters outside the shelter.
    - .4 At least two (2) weeks prior to start of concrete under protective shelter, prepare and submit the proposed Heating System Plan.

### **3.9 HOT WEATHER CONCRETING**

- .1 Comply with section 03 30 00 – Cast-in-place concrete for hot weather concreting.

**END OF SECTION**





## **PART 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 All sections included in Division 01 - General Requirements
- .2 Section 03 01 37 – Concrete restoration
- .3 Section 03 20 00 – Concrete reinforcing
- .4 Section 03 30 00 – Cast-in-place concrete
- .5 Despite previous enumeration, the Contractor shall obtain a copy of all sections of this specification even if they do not seem relevant to his specialty. The Contractor acknowledges implicitly that he accepts the clauses and prescriptions of all sections of the current specification, even if he fails to consult certain sections. Refer to the table of contents for a complete list of sections.

### **1.2 REFERENCES**

- .1 Unless otherwise indicated, the latest publication and amendments of the following standards prevail on the effective date of the contract.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-O86-14, Engineering Design in Wood.
  - .3 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .4 CSA O121-17, Douglas Fir Plywood.
  - .5 CSA O151-17, Canadian Softwood Plywood.
  - .6 CSA O153-13, Poplar Plywood.
  - .7 CAN/CSA-O325.0-13, Construction Sheathing.
  - .8 CSA O437 Series-[93(R2006)], Standards for OSB and Waferboard.
  - .9 CSA S269.1-[1975(R2003)], Falsework for Construction Purposes.
  - .10 CAN/CSA-S269.3-[M92(R2003)], Concrete Formwork, National Standard of Canada
- .3 Ministère des Transports du Québec
  1. Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (« CCDG 2019 »).
  2. Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3801, Mortiers cimentaires en sacs.
- .4 Underwriters' Laboratories of Canada (ULC)
  1. CAN/ULC-S701-[05], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .5 American Concrete Institute (« ACI »)
  1. Manual SP-4, Formwork for Concrete, 8th edition.
  2. ACI-347R-14, Guide to Formwork for Concrete.

- .6 Éditeur officiel du Québec
  - 1. Loi sur la santé et la sécurité au travail – Code de sécurité pour les travaux de construction (L.R.Q., S-2.1, r.4).

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

- .1 Submit shop drawings for formwork and falsework.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Québec, Canada, before formwork work starts. This approval does not engage the responsibility of the CPA Representative in any way. The Contractor is responsible for all shop drawings.
  - .2 For all chemical anchors installed, the Contractor shall submit a certificate of installation signed by an engineer member of the Ordre des Ingénieurs du Québec, after work completion but prior to formwork erection and at least 24 hours before concreting starts.
  - .3 For all formwork work, the Contractor shall submit a certificate of installation signed and sealed by an engineer member of the Ordre des Ingénieurs du Québec, after work completion and at least 24 hours before concreting starts.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with SIMDUT.
- .3 Co-ordinate submittal requirements and provide submittals required.
- .4 Shop drawings shall indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with references.
- .5 Indicate formwork design data: permissible rate of concrete placement, additives, and temperature of concrete, in forms.
- .6 At least 10 days prior to concreting, the Contractor must provide the PCA Representative detailed plans for approval showing the exact locations of all anchors, sleeves and other accessories to be poured into cast-in-place concrete.
- .7 Indicate sequence of erection and removal of formwork/falsework as directed by PCA representative

### **1.4 FORMWORK DESIGN**

- .1 Comply with all the provisions of the Safety Code for construction work.
- .2 At all times, and for each aspect of execution, the Contractor shall comply with the current governmental standards (municipal, provincial and federal) ruling the Contractor's duties and obligations with respect to workers' protection on construction sites.
- .3 Formwork shall be designed according to state-of-the-art practice. The utmost care shall be exercised in order to avoid loads which might exceed allowable stresses.
- .4 Formwork drawings must be stamped and signed by an Engineer member of the Ordre des Ingénieurs du Québec. The services of this Engineer, hereinafter called the "Contractor's Engineer", will be retained and paid by the Contractor.
- .5 The Contractor's Engineer must stamp and sign a certificate of compliance of the implemented work with the one shown on the drawings issued for construction.

- .6 Submit copies of the formwork shop drawings, as well as each statement of the Contractor's Engineer, in accordance with the requirements of the structural documents, section "01 33 00 - Submittal Procedures", and requirements of the Commission des normes, de l'équité, de la santé et de la sécurité du travail ("CNESST").
- .7 If required, formwork shoring sub-lugs shall be provided with sufficiently wide skids to allow the load to be well distributed and to prevent their penetration into the ground or surface coating.
- .8 The APC Representative will not perform his own formwork inspection until all the requirements of the above sub-items have been met.

## **1.5 DESIGN REQUIREMENTS**

- .1 Prior to concrete demolition, the Contractor shall inspect the walls in order to locate unsound concrete areas.
- .2 Place and secure on site all survey markers required to erect forms in strict accordance with the lines and levels shown on the plans.
- .3 The Contractor is solely responsible for the accuracy of these survey markers and must check them regularly and whenever the APC Representative deems it necessary.
- .4 Replace or rectify immediately any marker that has been removed or relocated before the concrete work for which it is required has been performed and approved by the APC Representative.
- .5 The Contractor is fully responsible for performing all calculations and survey work necessary for the proper installation of the formwork, all in accordance with all contractual documents.
- .6 At all times and throughout all concrete work duration, concrete structures shall be installed using simple and verifiable on-site methods in such a way that the APC Representative can validate the accuracy of the work performed using a measuring tape.

## **1.6 TOLERANCE**

- .1 The specific tolerances of height, flatness, horizontality, verticality, location and geometrical configuration of the anchors and concrete elements, after stripping of forms, shall be in accordance with the tolerances prescribed by the most recent edition of CAN / CSA-A23.1 / A23.2, sections 6.4 and 7.5, straight rule method. The Contractor Shall strictly respect all the requirements in this matter.
- .2 If the tolerances specified in clauses 6.4 and 7.5 of CAN / CSA-A23.1 have not been observed during the construction of any part of the work shown on the drawings, the APC Representative may require this item to be demolished and rebuilt to the specified tolerances at no additional cost.

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

- .1 Store and manage hazardous materials in accordance with Section « 01 35 43 – Environmental procedures».
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 19 – Waste Management Disposal.

- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert wood materials from landfill to a recycling or a reuse facility as approved by the APC representative.
- .4 Divert plastic materials from landfill to a recycling or a reuse facility as approved by the APC representative.
- .5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the the APC 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. Steel forms are also allowed.
- .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 deeper than 50mm. All form ties holes shall be filled carefully. Fill shall be smoothed and shall not stain surrounding surfaces.
- .3 Form ties cones filling:
  - .1 Pre-mixed product containing a non-metallic aggregate, cement, a plasticizer and a water reducer, of a consistency suitable for sealing and capable of achieving a compressive strength of 50 MPa at 28 days.
  - .2 Fill with mortar all conical cavities left after removal of the plastic cones. Prior to application, moisten the area as requested by the manufacturer. After smoothing the mortar, smooth the surface so that it merges with surrounding concrete surfaces. Proper curing shall be provided.
- .4 Form liner:
  - .1 Plywood: Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, Poplar to CSA O153.
  - .2 Waferboard: to CAN/CSA-O325.0.
- .5 Form release agent: non-toxic, biodegradable, low VOC.
- .6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .7 Chemical anchoring system
  - .1 The entire chosen chemical anchoring system must come from a single manufacturer.
  - .2 All chemical anchors used for this project shall develop a resistance equal to 125% of the anchorage yield strength.
  - .3 For the purposes of this project, all chemical anchors must be made of galvanized steel.
  - .4 Submit to the APC Representative the data sheets and installation procedures.

## **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 prior to formwork erection.
- .2 Obtain APC representative approval for use of forms framing openings not indicated on drawings.
- .3 Fabricate and erect formwork in accordance with CSA S269.1 in order to obtain finished concrete structures of shapes, sizes and levels conforming to the drawings, located in the places indicated and meeting the tolerances specified in CSAA23.1 / A23.2. Forms shall be properly braced, bonded together to maintain the desired position and shape during concrete placement. Forms shall not be released until the concrete has reached the specified compressive strength or when it is authorized by the PCA Representative.
  - .1 Align the forms sides and make them watertight to prevent any loss of cement and water.
  - .2 Minimize the number of joints in the forms.
  - .3 In permitted locations, when wood forms are used, adequate reinforcements shall be placed on the back of the joints, between plywood panels, to ensure that plywood panels form a flat, continuous surface able to resist without any deformation or movement at all stages of concrete.
  - .4 Adjust the height of each prop installed under the forms to compensate for any settlements that may occur when the concrete is placed.
- .4 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise.
- .5 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
  - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .6 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.
- .7 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.
- .8 Before closing the forms, the CPA Representative shall be notified in advance in order to allow him to perform an inspection of the forms. Concreting cannot take place until written permission has been received from the CPA Representative.
- .9 All ties shall be removed, and visible holes sealed.

### **3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for the following minimum period of time after placing concrete.
  - .1 3 days for wall repairs, as long as a 17.5MPa minimum resistance has been reached, unless otherwise stated for cold weather conditions.

- .2 Concrete curing shall be provided for 7 days. The Contractor shall provide curing to all exposed areas once formwork is released.
- .3 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.
- .4 Due to atmospheric conditions, concreting process and curing conditions, the Engineer may specify the minimum period required prior to form release.

### **3.3 FORMS TEMPERATURE**

- .1 During concrete pouring, forms temperature shall be maintained above 10°C.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 All sections included in Division 01 - General Requirements.
- .2 Section 03 01 37 – Concrete restoration
- .3 Section 03 10 00 – Concrete forming and accessories
- .4 Section 03 30 00 – Cast-in-place concrete
- .5 It is the Specialized Contractor's responsibility to obtain a copy of all the sections of this specification even if they do not seem relevant to his specialty. The Contractor acknowledges implicitly that he accepts the clauses and prescriptions of all sections of the specification, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections.

### **1.2 REFERENCES**

- .1 Unless otherwise indicated, the latest publication and amendments of the following standards prevail on the effective date of the contract.
  - .1 American Concrete Institute (ACI)
    - .1 ACI 315R-18, Guide to Presenting Reinforcing Steel Design Details.
    - .2 ACI SP-066(04), ACI Detailing Manual.
  - .2 ASTM International
    - .1 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
    - .2 ASTM A143/A143M-07 (C2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
    - .3 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - .4 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip Galvanized) on Iron and Steel Hardware.
    - .5 ASTM B695-04(2016), Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
  - .3 CSA International
    - .1 CAN/CSA-A23.1-14/A23.2-14, Béton: Constituants et exécution des travaux/Méthodes d'essai et pratiques normalisées pour le béton.
    - .2 CAN/CSA-A23.3-14, Calcul des ouvrages en béton.
    - .3 CAN/CSA G30.3-M-1983 (C1998), Fil d'acier étiré à froid pour l'armature du béton.
    - .4 CAN/CSA-G30.18-09 (C2014), Barre d'acier au carbone pour armature du béton.
    - .5 CAN/CSA-G164-18, Hot dip galvanizing of irregularly shaped articles.
  - .4 Ministère des Transports du Québec (MTQ)



- .1 Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (« CCDG 2019 »).
- .2 Ouvrages routiers, Normes, Tome VII – Matériaux, norme 5101, Armature pour les ouvrages en béton.
- .5 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC-2006, Reinforcing Steel Manual of Standard Practice.

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

- .1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice, ACI SP-066(04) and ACI 315R.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Canada, Province of Québec.
  - .2 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 PCA Representative, with identifying code marks to permit correct placement without reference to structural drawings, in accordance with RSIC Manual of Standard Practice.
    - .5 Drawings shall also indicate sizes, spacings and locations of chairs, spacers, additional rebar, hangers and other accessories required to support and maintain reinforcement in place during concreting.
  - .3 Wait for final approval of shop drawings before cutting and shaping rebar.
  - .4 Provide details of reinforcement placement under special conditions.
  - .5 Markings shall be given to the reinforcements so that they are easily and quickly identifiable on the order forms.
- .3 The Contractor shall submit a certificate of installation of the reinforcement signed by an engineer member of the Ordre des Ingénieurs du Québec, after work completion, prior to formwork installation and at least 24 hours before the beginning of concreting.

### **1.4 QUALITY ASSURANCE**

- .1 Quality assurance.
  - .1 Mill Test Report: Provide PCA Representative with certified copy of mill test report of reinforcing steel, minimum four (4) weeks prior to beginning reinforcing work.
  - .2 Submit in writing to PCA Representative proposed source of reinforcement material to be supplied.

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

- .1 Deliver the reinforcement to the building site in clearly identified batches.
- .2 Handle reinforcement with care to avoid warping or damaging galvanizing protection.

- .3 Immediately after delivery on site, stack reinforcing steel properly on wood stringers to protect them from rust so that they are not in contact with the ground.
- .4 When there is snow, cover all the steel stored with a woven fabric, to protect it from the weather.
- .5 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .6 Storage and Handling
  - .1 Store materials so that they are not in contact with the ground, in a clean place, as recommended by the manufacturer.
  - .2 Replace damaged reinforcement with new.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Ensure reinforcement is free of dirt, rust, concrete residues from previous concreting operations and oil.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 For the purpose of this project, all reinforcing steel shall be galvanized steel.
- .5 Cold-drawn annealed steel wire ties: to CSA-G30.3.
- .6 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

### **2.2 FABRICATION**

- .1 Unless otherwise indicated, steel reinforcement shall be shaped to CAN / CSA-A23.1 / A23.2 and ACI 315R, as well as to the Recommended Standards Manual, published by the Reinforcing Steel Institute of Canada (RSIC) and SPI-066 (04), ACI Detailing Manual, published by ACI.
- .2 The PCA Representative shall approve the location of the splices other than those indicated on the drawings.
- .3 Reinforcement batches shipped shall be clearly marked with an identification code, in accordance with the list of required reinforcing bars and their bending details.
- .4 Unless otherwise specified, straight development and overlap lengths shall be in accordance with CAN / CSA-A23.3.

### **2.3 SOURCE QUALITY CONTROL**

- .1 Upon request, provide PCA Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum four (4) weeks prior to beginning reinforcing work.
- .2 Upon request inform PCA Representative of proposed source of material to be supplied.

### **Part 3 EXECUTION**

#### **3.1 PREPARATION**

- .1 Galvanizing to include chromate treatment.
  - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

#### **3.2 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by PCA 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 in accordance with CSA-A23.1/A23.2.
- .2 Securely fasten reinforcing bars with galvanized steel wire ties to prevent movement when placing concrete:
  - .1 Securely fasten reinforcement to crossings if these crossings are 300 mm or more apart or every two (2) crossings if this distance is less.
  - .2 In the case of repair work, formwork reinforcement is attached to the formwork fasteners.
  - .3 To attach reinforcement, use at least a 1.6mm (16 gauge) diameter galvanized annealed steel wire.
  - .4 Wires shall be bent to obtain the same cover as required for reinforcement.
- .3 Replace existing reinforcing bars in their original position if fasteners have been altered during the demolition work.
  - .1 Fasten reinforcement to each formwork fastener in order to respect the required cover and a distance of at least 25 mm between reinforcement and concrete to be retained.
- .4 Use plastic spacers installed at a maximum distance of 1200 mm from center to center to maintain reinforcement at required distance from formwork, soil or existing concrete:
  - .1 Use circular plastic spacers attached to the reinforcement to maintain in position the reinforcement layers consisting of 15 M and 20 M bars.
  - .2 Use plastic spacers to maintain in vertical position reinforcement layers consisting of 25M bars or larger.
  - .3 Use continuous spacers with plastic-lined wires and plastic tabs to keep the reinforcement layer closest to the existing form, soil or concrete in a horizontal position.
  - .4 Unless otherwise indicated in the drawings and specifications, use individual plastic spacers for other horizontal reinforcing plies.

- .5 During repair work, at the request of the PCA Representative, add reinforcement if the existing reinforcement bars to be preserved are sufficiently corroded to reduce the structural capacity of the element.
  - .1 Install additional reinforcement to obtain minimum overlap of 600 mm.
  - .2 Demolish, if required, healthy concrete to meet this requirement.
  - .3 Request PCA Representative to accept reinforcement and placement prior to pouring concrete.
- .6 Prior to placing concrete, obtain PCA Representative's approval of reinforcing material and placement.
- .7 Ensure cover to reinforcement is maintained during concrete pour.
- .8 Ensure reinforcement is clean, free of dirt, oil or other contaminants. Clean reinforcing bars before concrete pour.
- .9 Reinforcement supports spacing in the formwork shall not exceed 72 times the smallest diameter of the supported bars nor 1000 mm x 1000 mm.
- .10 During transportation and handling, cover portions of galvanized bars to ensure adequate protection.

### **3.4 REINFORCEMENT COVER**

- .1 Ensure cover to reinforcement is maintained during concrete pour.
- .2 Unless otherwise specified on the drawings, the minimum rebar cover to consider shall be 75mm.

### **3.5 FIELD TOUCH-UP**

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

### **3.6 REINFORCING STEEL TEMPERATURE**

- .1 By the time of concrete pour, reinforcing steel temperature installed in formworks shall not be less than 5 degrees C.

### **3.7 CLEANING**

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

**END OF SECTION**



**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 All sections included in Division 01 - General Requirements.
- .2 Section 03 01 37 – Concrete restoration
- .3 Section 03 10 00 – Concrete forming and accessories
- .4 Section 03 20 00 – Concrete reinforcing
- .5 Despite previous enumeration, the Contractor shall obtain a copy of all sections of this specification even if they do not seem relevant to his specialty. The Contractor acknowledges implicitly that he accepts the clauses and prescriptions of all sections of the current specification, even if he fails to consult certain sections. Refer to the table of contents for a complete list of sections.

**1.2 REFERENCES**

- .1 Unless otherwise indicated, the latest publication and amendments of the following standards prevail on the effective date of the contract.
  - .2 ASTM International
    - .1 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or [50 mm] Cube Specimens).
    - .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 C332-17, Standard Specification for Lightweight Aggregates for Insulating Concrete.
    - .5 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
    - .6 ASTM C779/C779M-12, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
    - .7 ASTM C827/C827M-16, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
    - .8 ASTM C882/C882M-13a, Standard Test Method for Bond Strength of Epoxy-resin Systems Used with Concrete by Slant Shear.
    - .9 ASTM C939/C939M-16a, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
    - .10 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - .2 CSA International
    - .1 CSA-A23.1-14/A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.
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- .2 CSA-A283-06 (R2016), Qualification Code for Concrete Testing Laboratories.
- .3 CSA-A3000-13, Compendium des matériaux liants (Contient A3001, A3002, A3003, A3004 et A3005).
- .4 CAN/CSA-A23.3-14, Règles de calcul des ouvrages en béton.
- .3 Bureau de normalisation du Québec (« BNQ »)
  - .1 NQ 2560-114, Travaux de génie civil – Granulats.
  - .2 NQ 2621-905, Béton prêt à l'emploi – Programme de certification
- .4 American Concrete Institute (« ACI »)
  - .1 ACI 117-10 (R2015), Specification for Tolerances for Concrete Construction and Materials (ACI117-10) and Commentary (ACI 117R-10).
- .5 Ministère des Transports (MTQ)
  - .1 Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (« CCDG 2019 »).
  - .2 Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3101, Béton de masses volumiques normales.
  - .3 Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3501, Matériaux de cure.
  - .4 Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3801, Mortiers cimentaires en sac.
  - .5 Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3901, Coulis cimentaires.

### 1.3 DEFINITIONS

- .1 Portland cement: hydraulic cement or composite hydraulic cement where the suffix "b" indicates that it is a composite product).
  - .1 Type GU or GUb: general purpose cement.
- .2 Binders
  - .1 Type F / SF: with a silica fume content of at least 5% and a fly ash content of at least 15%.
  - .2 Type S / SF: having a blast furnace granulated slag content of at least 15%, and a fly ash content of at least 15%.
  - .3 SF type: with a silica fume content of at least 8%.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 At least four (4) weeks prior to beginning Work, provide PCA Representative with concrete formulas for approval by the Laboratory mandated by the PCA Representative and a certificate stating that the selected formulas will produce concrete of the prescribed quality, strength and performance, in accordance with requirements prescribed by MTQ 3101 standard.

- .3 Provide testing results and reports for review by the PCA Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 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 section 3.9 On-Site Quality Control.
- .5 Concrete hauling time: provide for review by PCA Representative deviations exceeding maximum allowable time of 105 minutes for concrete to be delivered to site of Work and discharged after batching.
- .6 Provide two (2) copies of WHMIS MSDS.

## **1.5 QUALITY ASSURANCE**

- .1 All concrete shall be ready-mix and shall come from a single plant with an ABQ-BNQ certification. The choice of the manufacturer is subject to the approval of the PCA Representative.
  - .2 The concrete manufacturer is solely responsible for the concrete mix and must, at his own expense, take all necessary measures to ensure its product quality and consistency.
  - .3 Provide a certificate stating that the plant, equipment and materials to be used meet the requirements of CSA-A23.1 / A23.2.
  - .4 Provide a certificate attesting that the mix design shall produce concrete with the prescribed quality and performance. The concrete strength shall meet MTQ, CAN / CSA-A23.1 and 3101 standards requirements, and the formula shall prevent problems that may be caused by the alkali-granular reaction.
  - .5 Provide PCA Representative, minimum four (4) 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.
  - .6 Provide test data, certificates of conformity, data sheets and certification issued by a recognized and independent inspection and testing laboratory stating that the materials used and the design mix meet the specified requirements.
  - .7 Minimum four (4) weeks prior to starting concrete work, provide proposed quality control procedures for review by PCA Representative on following items:
    - .1 Falsework erection.
    - .2 Chemical anchors installation.
    - .3 Hot weather concrete.
    - .4 Cold weather concrete.
    - .5 Curing.
    - .6 Finishes.
    - .7 Formwork removal.
    - .8 New concrete cast against existing concrete.
    - .9 Concrete pumping.
    - .10 Joints.
-



- .8 Quality Control Plan: provide written report to PCA Representative verifying compliance that concrete in place meets performance requirements as established in section 2.2.
- .9 Perform the following tests in accordance with section "01 45 00 - Quality Control" and submit a report as described in section "01 33 00 - Submittal Procedures".
  - .1 Temperature and air content of poured concrete.
  - .2 On-site collection of concrete specimens for laboratory analysis.
  - .3 Records of ambient temperature during concrete pouring.
- .10 Concrete inspection and testing is performed by the Laboratory designated by the PCA Representative, to the satisfaction of the PCA Representative, in accordance with CSA-A23.1 / A23.2.
- .11 The Laboratory shall be certified in accordance with CSA A283.
- .12 Test results shall be transmitted for review to the PCA Representative during the meeting occurring prior to concrete pouring.
- .13 The laboratory will take additional specimens if concrete work occurs in cold weather.
- .14 Specimens curing shall be performed on-site, under the same conditions as the concrete batches from which they are extracted.

## **1.6 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 PCA Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by PCA Representative.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

## **1.7 SITE CONDITIONS**

- .1 Place concrete in accordance with limit temperatures specified in CAN / CSAA23.1 / A23.2.
  - .2 Do not put concrete in place:
    - .1 If air temperature is above 22 ° C.
    - .2 In case of rain or excessive wind or dust.
    - .3 When conditions, in the opinion of the PCA Representative, appear to be detrimental to the concrete.
    - .4 Comply with cold weather requirements when air temperature drops below 5 ° C.
-

## **Part 2 PRODUCTS**

### **2.1 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: Concrete supplier shall be able to provide concrete meeting the performance criteria established by the PCA Representative and perform a compliance check of the materials according to the Contractor specifications described in Part 1 - "INSURANCE AND QUALITY CONTROL" section.

### **2.2 MATERIALS**

- .1 Blended hydraulic cement: Type GUB to CSA A3001.
  - .2 Supplementary cementing materials: with minimum 8% silica fume or 15% fly ash replacement, by mass of total cementitious materials to CSA A3001 and MTQ 3101 standard.
  - .3 Water: to CSA A23.1 and MTQ 3101 standard.
  - .4 Fine aggregates: normal density, to [CSA A23.1/A23.2] and MTQ 3101 standard.
  - .5 Coarse aggregate: normal density, aggregate size complying to CSAA23.1/A23.2 standard, section 4.2.3, and to MTQ 3101 standard. Particles shall be sound, durable, free of dust and deleterious materials.
  - .6 Aggregates: complying with CAN/CSA-A23.1/A23.2 and MTQ 3101 standards. A certificate of conformity shall specify that aggregates comply with the DB classification included in the CTQM200 protocol relating to the swelling potential petrographic index (S.P.P.I.).
  - .7 Stone quarries shall be selected among quarries which commissioned an independent laboratory to perform an in-depth analysis of their aggregates. The in-depth analysis shall provide, at least, information about the following tests:
    - .1 A visit of the quarry/sandpit by a geologist/geotechnical engineer;
    - .2 Face inspection, for the on-going year;
    - .3 Collection, by a geologist/geotechnical engineer, of representative samples of the aggregates stocks;
    - .4 Complete petrographic analysis, and thin section analysis;
    - .5 Percentages of pyrite and pyrrhotite;
    - .6 Total sulfur content;
    - .7 A summary report including the six elements above mentioned, signed by a geologist/geotechnical engineer.
  - .8 Admixtures:
    - .1 Air entraining admixture: to ASTM C260.
    - .2 Chemical admixture: to ASTM C494 and ASTM C1017. The use of calcium chloride or adjuvants containing it is not allowed. PCA Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
    - .3 Use of calcium chloride is prohibited.
    - .4 Addition of a superplasticizer to the concrete, before it is cast in place, is mandatory unless otherwise indicated by the construction professional.
-

- .5 The total mass of cementitious additions (fly ash and silica fume or slag and silica fume) shall not be greater than 30% of the total mass of Portland cement.
- .6 Ensure that admixtures used are compatible and incorporated into concrete according to manufacturer's instructions. If an adjuvant is found to be harmful or ineffective, replace it immediately with a substitute approved by the construction professional; assume all the costs.
- .9 Non-shrink grout or mortar: Pre-mixed product containing non-metallic aggregates, Portland cement, plasticizer and water reducer, in accordance with CSA-A23.1 / A23.2.
  - .1 Able to achieve a compressive strength of 15 MPa at 24 hours and 35 MPa at 7 days.
  - .2 Net shrinkage: not more than 2% at 28 days.
- .10 Unmixed Dry Grout: A product containing Portland cement based on non-metallic aggregates and enough water to maintain its shape when pelletized in its hands and capable of achieving a compressive strength of 50 MPa. at 28 days.
- .11 Superplasticizer: to ASTM C494/C494M
- .12 Curing compound: to CSA A23.1/A23.2.
- .13 Weep hole tubes: plastic.
- .14 Refer to section 03 10 00 – Concrete forming and accessories for all other products related to concrete

## **2.3 MIXES**

- .1 The Contractor shall submit the concrete mix designs to the construction professional for approval. No concrete can be cast-in-place if the mix design has not been approved.
- .2 Prepare concrete of normal density in accordance with article 4 of CAN/CSA-A23.1 and MTQ 3101 standards, and as indicated in structural drawings.
- .3 Ensure that the concrete supplier meets the performance requirements defined below and perform the conformity check as described in the "ON-SITE QUALITY CONTROL" section of PART 3.
- .4 Provide concrete mix to meet following plastic state requirements:
  - .1 Uniformity.
  - .2 Pumpability.
  - .3 Workability: free of surface blemishes, loss of mortar, colour variations, segregation.
  - .4 Finishability: 2% amount of bleeding to be absorbed within 24 hours maximum.
  - .5 Set time: normal.
- .5 Provide type XIV-R or XIV-S concrete mixes (35 MPa) for concrete elements to be repaired with a partial depth repair, in accordance with drawings MTQ 3101 "Normal density concrete" standard specifications.
  - .1 Characteristics of type XIV-R fresh cast-in-place concrete:
    - .1 Cement: type GUB-F / SF or GUB-S / SF

- .2 Sagging: -
- .3 Air content: 6% to 9%
- .4 Maximum Water / Binder Ratio: 0.35 to 0.40
- .5 Aggregates / coarse aggregates: diameter 2.5 - 10 mm
- .6 Provide a document attesting that the chosen mix will produce a concrete of the prescribed quality and with the expected performance and strength in accordance with CAN / CSA-A23.1 and MTQ 3101 standards.
- .7 Use of cement with an alkali content of less than 0.6%.
- .8 Addition of silica fume in accordance with MTQ 3101.
- .2 Characteristics of type XIV-S cast-in-place fresh concrete (for small quantities):
  - .1 Cement: type GUb-SF, GUb-F / SF or GUb-S / SF
  - .2 Sagging: -
  - .3 Air content: 5% to 9%
  - .4 Maximum water / binder ratio: -
  - .5 Aggregates / coarse aggregates: diameter 2.5 - 10 mm
  - .6 Provide a document attesting that the chosen mix will produce a concrete of the prescribed quality and with the expected performance and strength in accordance with MTQ standards CAN / CSA-A23.1 and 3101.
  - .7 Use of cement with an alkali content of less than 0.6%.
  - .8 Addition of silica fume in accordance with MTQ 3101.
- .3 Once cured, concrete mixes shall comply with the following requirement:
  - .1 Durability and classes of exposure: C-1
- .6 Provide type XIV-C or XVII concrete mixes (35 MPa) for concrete elements to be repaired with an added thickness, in accordance with drawings and MTQ Standard 3101 "Normal density concrete" specifications.
  - .1 Characteristics of fresh cast-in-place concrete type XIV-C:
    - .1 Cement: type GUb-SF, GUb-F / SF or GUb-S / SF
    - .2 Sagging: -
    - .3 Air content: 5% to 9%
    - .4 Maximum water / binder ratio: -
    - .5 Aggregates / coarse aggregates: diameter 5 - 14 mm
    - .6 Provide a document specifying that the chosen mix will produce a concrete of the prescribed quality and with the expected performance and strength in accordance with MTQ standards CAN / CSA-A23.1 and 3101.
    - .7 Use of cement with an alkali content of less than 0.6%.
    - .8 Addition of silica fume in accordance with MTQ 3101.
  - .2 The characteristics of fresh cast-in-place concrete type XVII:
    - .1 Cement: type GUb-SF, GUb-F / SF or GUb-S / SF
    - .2 Sagging: -
    - .3 Air content: 5% to 9%
    - .4 Maximum water / binder ratio: -

- .5 Aggregates / coarse aggregates: diameter 2.5 - 10 mm
- .6 Provide a document specifying that the chosen mix will produce a concrete of the prescribed quality and with the expected performance and strength in accordance with MTQ standards CAN / CSA-A23.1 and 3101.
- .7 Use of cement with an alkali content of less than 0.6%.
- .8 Addition of silica fume in accordance with MTQ 3101.
- .3 Once cured, the concrete mix must meet the following requirements:
  - .1 Durability and exposure class: C-1
- .7 Compressive strength: at least 35 MPa at 28 days

### **Part 3 EXECUTION**

#### **3.1 PREPARATION**

- .1 Obtain PCA Representative's written approval before placing concrete.
    - .1 Provide 24 hours minimum notice prior to placing of concrete.
    - .2 Provide 24 hours minimum notice to Testing laboratory
  - .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
  - .3 During concreting operations:
    - .1 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
  - .4 Pumping of concrete is permitted only after approval of equipment and mix.
  - .5 When concrete is pumped, mix designs shall be adjusted accordingly. Concrete characteristics shall be maintained until it reaches the pump outlet.
  - .6 When concrete is put in place with a pump, the first 0.5m<sup>3</sup> of concrete or grout shall be rejected.
  - .7 Ensure reinforcement and inserts are not disturbed during concrete placement. Formwork shall be securely fastened prior to and during concrete placement.
  - .8 Prior to placing of concrete obtain PCA Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
  - .9 Protect previous Work from staining.
  - .10 Clean and remove stains prior to application for concrete finishes.
  - .11 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
  - .12 Do not place load upon new concrete until authorized by PCA Representative.
  - .13 Strictly observe the requirements of poured concrete against existing or cured concrete.
  - .14 It is forbidden to pour concrete when it rains or snows, unless the PCA representative is satisfied with measures taken to protect concrete during transportation and placing and gives approval.
-

- .15 Authorization provided by the PCA Representative to pour concrete when outside temperature is lower than 5°C or greater than 25°C does not free the Contractor from its responsibility related to concrete resistance and durability

### 3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Due to its characteristics, self-placing concrete does not require to be vibrated.
- .3 The following requirements and procedures shall be respected when cast-in-place concrete is poured against previous Work:
- .1 Existing concrete surfaces in contact with cast-in place concrete shall be brush-hammered. Surfaces must have a minimum surface profile corresponding to the CSP7 configuration mentioned in Technical Guideline 0310.2R, published by ICRI. Profile evaluation is based on standard samples available from ICRI
  - .2 Surfaces shall be cleaned, wet and slightly dried in order to be damp (saturated surface dry) prior to concreting.
- .4 Concrete shall be poured continuously in layers of a thickness such that each new layer will integrate with the underlying layers before the concrete has hardened to the point of causing the formation of cold joints.
- .5 If concreting stops for more than 45 minutes, a construction joint shall be made.
- .6 If difficulties occur during installation, modify the concrete mix as directed by the Laboratory and use the admixture (s) prescribed; assume all the costs.
- .7 Sleeves and inserts:
- .1 Where approved by PCA Representative, set inserts and openings as indicated or specified elsewhere.
  - .2 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by DCC Representative.
  - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from PCA Representative before placing of concrete.
  - .4 Confirm locations and sizes of openings shown on drawings.
  - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .8 Anchor bolts:
- .1 Set anchor bolts to templates with a 1mm tolerance in co-ordination with appropriate trade prior to placing concrete.
  - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from PCA Representative.
    - .1 Formed holes: 100 mm minimum diameter.
    - .2 Drilled holes: to manufacturers' recommendations, 25 mm minimum diameter larger than bolts used.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with shrinkage compensating grout.
-

- .9 Drainage holes and weep holes:
  - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
  - .2 Install weep hole tubes and drains as indicated.
- .10 The Contractor has the entire responsibility to provide the anchors and other parts to be embedded in the concrete and coordinate their installation with his subcontractor in formwork. Should the Contractor fail to comply with this requirement and the concrete of a constructed part of the work shown on the drawings does not contain the anchors and other inserts, the PCA Representative will require that the element be demolished and rebuilt, at no additional cost and without delaying work delivery.
- .11 Finishing and curing:
  - .1 Finish concrete to CSA A23.1/A23.2.
  - .2 Use procedures as reviewed by PCA Representative to remove excess bleed water. Ensure surface is not damaged.

### **3.3 CONSTRUCTION JOINTS**

- .1 Not used.

### **3.4 CONCRETE CURING**

- .1 Obtain PCA Representative's written approval at least 24 hours in advance of proposed the curing method.
  - .2 Curing to CSA-A23.1/A23.2, section 7.7, for repair concrete.
  - .3 Unless otherwise stated, the use of curing agents is prohibited.
  - .4 Where applicable, when the PCA Representative provides written approval, use curing agents compatible with the finish applied to concrete surfaces. Attach a written statement certifying that the various products used are compatible. The curing agent shall be cleaned after the treatment so as not to leave any trace of the application.
  - .5 Concrete curing of horizontal surfaces is ensured by the use of curing blankets constantly wet for a period of at least 7 to 10 consecutive days at a temperature maintained at 10 ° C. The covers used must overlap by 150mm, be well sealed together and completely cover the surface, including the edges of the slabs.
  - .6 Curing of walls and other formworked surfaces extends over a period of 7 days:
    - .1 Formwork left in place with wet cure on the top of the elements: 3 days;
    - .2 Wet curing on all surfaces of elements after removal of formwork: 4 days.
  - .7 When the outside temperature exceeds 20 ° C for mass concrete or 27 ° C otherwise, maintain forms wet prior to pouring concrete and for the period of time they remain in place.
  - .8 Ensure that, during the entire curing process, the concrete will not be overloaded and will be adequately protected against severe impact, excessive vibration, weather and other disturbances.
-

- .9 Supply, installation and maintenance of all temporary structures and equipment required for curing and concrete protection in hot or cold weather, as well as this equipment power supply are part of the contract work, assume all the costs.
- .10 All tools required for curing and concrete protection must be readily available and ready for use prior to beginning concrete placement.
- .11 When concrete has set sufficiently, exposed surfaces must be kept continuously wet for at least seven consecutive days after placing concrete. The water used for hardening must be clean and free of any material that may stain or discolor the concrete.
- .12 Concrete curing shall begin immediately after surface finishing. The Contractor will not be authorized to start concreting unless it has previously demonstrated to the PCA Representative that all equipment and personnel required for curing and protection of the concrete is within the reach of the Contractor. hand and ready to be used.
- .13 The Contractor shall forecast in his work schedule that certain floor and coating finishes require specific moisture conditions of the concrete and that these cannot be achieved until a certain period of ripening.

### **3.5 SLAB ON GRADE**

- .1 Not used.

### **3.6 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.1 Straight edge Method.

### **3.7 HOT WEATHER CONCRETING**

- .1 When outside temperature is greater than or equal to 25 degrees C or is expected to be greater than 25 degrees C within 24 hours, concrete temperature must be less than 25 degrees C during pouring.
- .2 Necessary measures shall be taken to prevent overheating of thick concrete elements during the first three (3) days after pouring.

### **3.8 COLD WEATHER CONCRETING**

- .1 Provide shelter heating to comply with this section and CSA Standard A23.1 / A23.2 material temperatures requirements during concreting, concrete constituents and temperature. during concrete cure.
  - .2 Maintain a minimum temperature of 10 degrees C for a minimum period of seven (7) consecutive days following concreting.
    - .1 Extend the protection period until the concrete has reached 70% of the required compressive strength at twenty-eight (28) days.
  - .3 After the protection period, gradually lower the concrete temperature during the first twenty-four (24) hours.
    - .1 Temperature decrease rate shall not be greater than 10 ° C / hour.
    - .2 Do not put concrete in contact with outside air if the temperature difference of the concrete and the outside air is greater than 20 degrees C.
  - .4 Concrete cure requirements apply, regardless of the type of protection put in place.
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- .5 Part of the structure built with concrete that has frozen is considered to be defective and shall be rebuilt according to drawings and specifications, at the expense of the Contractor.
- .6 The use of sodium chloride or calcium as a de-icing agent is prohibited.
- .7 In the case of open-air concreting, heat all surfaces (existing concrete, reinforcement, formwork, etc.) in contact with plastic concrete until a minimum temperature of 5 degrees C is reached.
- .8 In the case of concreting under shelter, heat and maintain contact surfaces at a temperature between 5 degrees C and 20 degrees C for a period of at least 24 hours before concreting.
- .9 Keep forms in place for the protection duration and maintain the form surfaces at a temperature of 10 degrees C and 20 degrees C for the duration of the protection.
- .10 Types of protection
  - .1 Insulation
    - .1 Use insulating material to cover plastic concrete surface.
      - .1 Each layer of insulating material shall be a watertight cover type made from closed cell foam board and have an RSI thermal resistance of 0.40.
    - .2 The day before concreting, have the PCA Representative approve the number of layers of insulating material to be laid.
      - .1 Depending on the evolution of the concrete temperature during the protection period, the PCA Representative may require reducing or increasing the number of layers; the removal or addition of a layer must be done within three (3) hours of the request of the PCA Representative.
    - .3 Ensure that the insulation is laid in such a way that it prevents any exposure of the concrete surfaces to outside air for the duration of the protection.
    - .4 Insulating covers shall have an overlap of at least 75 mm.
  - .2 Temporary shelter
    - .1 Construct protective shelters that enclose structures.
    - .2 At least two (2) weeks before the start of concrete work under protective shelters, prepare and submit the Plan of realization of these shelters.
    - .3 Make the shelter to cover the surfaces of the concrete work with canvas and tarpaulins.
    - .4 These covers must be watertight, resistant and fixed so as not to be displaced during the period of protection.
    - .5 Ensure shelter is of sufficient height and size to accommodate interior, concrete placement, concrete finish and curing.

### **3.9 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit results as described in article 1.3 included in section 01 33 00 – Submittal procedures.

- .1 Concrete pours.
- .2 Air content.
- .3 Compressive strength at 7 and 28.
- .4 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by PCA Representative for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Tests shall be performed to allow faster form removal. These tests or any other test carried out at the request of the Contractor shall be paid by the Contractor.
- .4 The Laboratory is the PCA Representative for all matters relating to the dosing and placement of concrete, and as such, is authorized to issue directives to which the Contractor and its concrete supplier must comply.
- .5 Cooperate with Laboratory personnel so that during each pour, they can closely monitor concrete placement and collect samples required for testing.
- .6 Provide a sheltered area on site where concrete cylinders may be stored at an ambient temperature of not less than 10 ° C and not more than 25 ° C prior to shipment to the Testing Laboratory.
- .7 For every 15 m<sup>3</sup> of concrete put in place, the Laboratory will take concrete samples in place, with which four (4) standard cylinders will be molded for use in the 7- and 28-day resistance tests. However, the Laboratory will never take less than one (1) sample per day of the concrete from each installed class, for each type of structural element executed.
- .8 Ensure that test results are forwarded to the PCA Representative and Test Laboratory Representative for review during the pre-concreting meeting.
- .9 The Laboratory Representative will take additional test specimens during cold weather concreting work. Curing of these specimens must be done on site, under the same conditions as the concrete from which they are extracted.
- .10 Non-destructive testing of concrete shall be performed in accordance with the methods described in CSA-A23.1 / A23.2 at 3, 7, 14, and 28 days.
- .11 Inspection and testing by the Laboratory Representative or PCA Representative may not replace or supplement the Contractor's quality control, nor does it release him from his responsibilities.
- .12 When tests or inspections of the test laboratory reveal non-compliance with the requirements of the contract, the Contractor shall bear the cost of any additional tests that may be requested by the PCA Representative in order to verify acceptability after corrections are made.

**END OF SECTION**

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## **PARTIE 1      GENERAL**

### **1.1            RELATED REQUIREMENTS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 03 30 00.01 – Cast-in-Place Concrete (Short Form).

### **1.2            REFERENCES**

- .1      ASTM International
  - .1      ASTM A53/A53M-[07], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2      ASTM A269-[08], Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3      ASTM A307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2      CSA International
  - .1      CSA G40.20/G40.21-[F04 (C2009)], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2      CAN/CSA G164-[FM92 (C2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3      CSA S16-[09], Design of Steel Structures.
  - .4      CSA W48-[F06], Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5      CSA W59-[FM03 (C2008)], Welded Steel Construction (Metal Arc Welding) [Metric].
  - .6      CSA S6 00, Canadian code for roadway bridge calculations.
- .3      Environmental Choice Program
  - .1      DCC-047-[98 (R2005)], Architectural Surface Coatings.
  - .2      DCC-048-[98 (R2006)], Surface Coatings - Recycled Water-borne.
- .4      Green Seal Environmental Standards (GS)
  - .1      GS-11-[2008, 2nd Edition], Paints and Coatings.
- .5      The Master Painters Institute (MPI)
  - .1      Architectural Painting Specification Manual - Last edition.
- .6      Cahier de Normes du Ministère des Transports du Québec
  - .1      Tome 2, Construction routière.
- .7      National Building Code of Canada (NBC)
  - .1      Last edition.

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

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing and bolts and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings for guardrails and fences stamped and signed by professional engineer registered or licensed in the province of Quebec, Canada and OIQ member.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, number, size and depth of anchors, supports, reinforcement, details, and accessories.
  - .3 Design must enable guard rails and fence to withstand vertical and horizontal loads under Canadian Building Code.
  - .4 Shop drawings must clearly indicate the following:
    - .1 Locations and elevations.
    - .2 The installation of columns and concrete bases
    - .3 Different types of fasteners, locations and accessories.
    - .4 Different materials, thicknesses, finishes, assemblies, connectors, joints, supports, reinforcements, anchors and welds.
    - .5 Fabrication and installation details.
    - .6 Plates and anchors specific to each type of surface.
    - .7 Parts specified in plans and drawings for guard rails and handrails are for indication purposes only. Shop drawings must specify sizes and placement of assembly and fastening details, and anchors on the different walls and surfaces.
  - .5 Samples:
    - .1 Galvanized steel plate (1), polyester powder coating in selected colour.

### **1.4 QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

## **1.4 DELIVERY, STORAGE AND HANDLING (scont'd)**

- .3 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 Replace defective or damaged materials with new.

## **PARTIE 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Steel parts, fence sections, gates salvaged from demolition of existing fences. Salvaged sections may be cut in height and length, and accessories may be salvaged as needed.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and anchor bolts: to ASTM A307.
- .5 Powder polyester paint.

### **2.2 METALWORK – GENERAL**

- .1 Erect metalwork straight, plumb, aligned and to required dimensions. Make joints tight.
- .2 Use flat, round, oval, self-tapping self-locking screws for screwed assemblies, unless otherwise indicated.
- .3 Shop adjust and assemble Work for delivery to site ready to install, wherever possible.
- .4 Make visible welds continuous; grind or file seams smooth and uniform.
- .5 Sandblast salvaged steel to remove paint and residual galvanizing material. Cut and shape to new dimensions and construction details.
- .6 Profiles must be clean, precise, free of nicks, hollows, bumps or other imperfections.
- .7 Shop assemble all metalwork indicated on drawings for on-site installation.

### **2.3 FINISHES**

- .1 Galvanizing: all steel, hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.

### **2.4 SHOP PAINTING**

- .1 Coat metallic components with the exception of galvanized parts embedded in concrete with a coat of shop applied paint.
- .2 Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Paint.
  - 1. Guardrails and barriers.
    - 1. Paint components uniformly, black, RAL 9004, mat, orange peel finish, to 92GP-12P.

## 2.4 SHOP PAINTING (cont'd)

2. Fence.
  1. Paint components uniformly, black, RAL 9004, mat.
  3. Make galvanized steel surfaces clean, smooth, uniform and free of drips.
  4. Preheat elements to be painted to 200oC for twenty to thirty minutes.
  5. Spray on polyester resin powder; apply powder electrostatically onto surface. Bake polyester resin powder to stabilize for glossy, hard, UV resistant finish. Minimum thickness 86 microns.
  6. Cure 10 days after painting and prior to delivery to work site.

## 2.5 PROTECTION

- .1 The Contractor must protect steel components from damage during handling and storage, delivery and installation. Store to allow air to circulate, water to drain and prevent metal to metal contact.
- .2 Replace damaged components.
- .3 Galvanize, paint or replace damaged components.

## 2.6 PERFORMANCE RESULTS FOR PAINT SYSTEM

Criteria	Normes	Results
Résistance to moisture	ASTM D-2247	1,500 hours
Resistance salt spray	ASTM B-117 ASTM D-1654	1,500 hours Result for 6 minimum

## 2.7 METAL TRELLIS FENCE

- .1 Omega-II Elite model, polyester baked black powder paint.
- .2 75 X 75 mm square posts with universal fasteners every 2,665 mm c.c. and galvanized steel square ends painted black. Adjust steel gauge for posts to manufacturer's specification and height.
- .3 1,230 X 2, 511 mm sections. 50 x 200 mm openings. Horizontal wire: 5.72 mm, vertical wire: 4.88 mm.
- .4 All panel section extremities cut on site must be painted using touch-up paint provided by the manufacturer.
- .5 Ends of the vertical rods must be pointing downwards.
- .6 Hardware: universal fasteners, U-shaped collars, screws, bolts, washers, black painted nuts, and aesthetic caps recommended by the manufacturer.

## 2.8 CONCRETE BASES

- .1 Concrete foundations for each fence and railing post, 400 mm diameter concrete base at 1,800 mm depth or equivalent with adequate anchor to existing rock.

### **PARTIE 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of PCA Representative.
  - .2 Inform PCA Representative of unacceptable conditions immediately upon discovery.

#### **3.2 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to PCA Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Assembly on site using bolts to CSA S16.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion.

#### **3.3 TOUCH-UPS**

- .1 Use shop prepared same product and colour paint to touch up components damaged or scratched during installation.
- .2 Provide client sufficient quantity of paint for touch-ups during warranty period.

#### **3.4 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

#### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**





**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 All sections of Divisions 01 - General Requirements, 02 - Existing Conditions and 06 - Wood.
- .2 It is the Specialized Contractor's responsibility to obtain a copy of all the sections of this specification even if they do not seem relevant to his specialty. The Contractor acknowledges implicitly that he accepts the clauses and prescriptions of all sections of the specification, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections.

**1.2 REFERENCES**

- .1 Unless otherwise indicated, the latest publication and amendments of the following standards prevail on the effective date of the contract.
  - .1 ASTM International
    - .1 ASTM A123-15 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
    - .2 ASTM A153/A153M-[09] Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
    - .3 ASTM A480/A480M-15 Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip
    - .4 ASTM A653/A653M-15 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
    - .5 ASTM F2329/F2329M-15 Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
  - .2 American Wood-Preservers' Association (AWPA)
    - .1 AWPA M2-[01], Standard for Inspection of Treated Wood Products.
    - .2 AWPA M4-[06], Standard for the Care of Preservative-Treated Wood Products.
  - .3 Association canadienne de normalisation (CSA)/CSA International
    - .1 CSA O80 Série 15, Wood preservation.
    - .2 CSA O322, Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit Submittal submissions: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Each piece of treated wood lumber must bear the certification mark in accordance with CSA O322.

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
- .2 For products treated with preservative by pressure impregnation, submit following information certified by authorized signing officer of treatment plant:
  - .1 Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.
  - .2 Moisture content after drying following treatment with water-borne preservative.
  - .3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.
- .3 Recommended materials and corrosion protection for metal connectors and fasteners.

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

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Wood treated with a preservative must be separated from materials and equipment to be recycled or reused.
- .3 Dispose of tips, waste and treated sawdust to a landfill accepting materials of this nature and notify the PCA Representative.

#### **1.5 QUALITY ASSURANCE**

- .1 Plant inspection of products treated with preservative by pressure impregnation will be carried out by designated testing laboratory to AWPA M2, and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.
- .2 Each piece of lumber and plywood for preserved wood foundations to be identified by CSA O322 certified stamp.
- .3 Inspection and testing of lumber wood will be carried out by a Testing Laboratory designated by a Testing Laboratory approved by the PCA representative.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 CAQ, AC and Ncu products are prioritized on the PCA territory since they do not generate active ingredients listed under LCPE. CCA treatment (compliant with CSA O80 standards) is not recommended for the PCA territory. In the event that the CCA is selected, the Contractor will have to demonstrate that it has not been able to find an alternative and it will need to obtain the PCA authorization to use the ACC.
- .2 Completely cover all CCA treated surfaces with sealant.

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**Part 3 EXECUTION**

**3.1 CONSTRUCTION**

- .1 Use connectors and fasteners that have corrosion protection specified in all construction work with treated wood products.

**3.2 WOOD INCISING**

- .1 Lumber greater than 64 mm in thickness shall be incision treated in accordance with Clause 9.8 CSA O80.

**3.3 PACKAGING**

- .1 With the exception of materials which will be treated with a water-soluble preservative, and prior to treatment, heat dried or unseasoned wood to remove moisture and improve permeability, absorption and moisture properties.

**3.4 APPLICATION: PRESERVATIVE**

- .1 Treat materials in accordance with O80 series requirements for use in a wet environment. Use a CCA preservative to achieve a retention rate of 24 kg /m<sup>3</sup>.
- .2 Perform preservation treatments in accordance with the recommendations of the Best Management Practices for the Use of Treated Wood in Aquatic Environments (BMP).
- .3 Wood must be conditioned before treatment to reduce moisture content.
- .4 All wood must be incised for preservation treatment.
- .5 After treatment with a water-soluble preservative, dry the material until an acceptable moisture level is reached.

**3.5 APPLICATION: FIELD TREATMENT**

- .1 Comply with AWPA M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2. Use a water-soluble preservative based on CCA to obtain a retention rate of 24 kg /m<sup>3</sup>.
- .2 Perform preservation treatments in accordance with the recommendations of the Best Management Practices for the Use of Treated Wood in Aquatic Environments (BMP).
- .3 After treatment with a water-soluble preservative, dry wood materials until an acceptable moisture level is reached.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 06 05 73 – Wood treatment.
- .2 It is the Specialized Contractor's responsibility to obtain a copy of all the sections of this specification even if they do not seem relevant to his specialty. The Contractor acknowledges implicitly that he accepts the clauses and prescriptions of all sections of the specification, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections.

### **1.2 REFERENCES**

- .1 Unless otherwise indicated, the latest publication and amendments of the following standards prevail on the effective date of the contract.
- .2 CSA International
  - .1 CSA O322-02, Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.
  - .2 CAN/CSA-S406-F92, Construction of Preserved Wood Foundations.
  - .3 CAN/CSA-Z809-08, Sustainable Forest Management.
  - .4 CAN/CSA-O80, Wood preservation.
- .3 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001, FSC Principle and Criteria for Forest Stewardship.
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113, Architectural Coatings.
  - .2 SCAQMD Rule 1168, Adhesives and Sealants Applications.
- .5 Sustainable Forestry Initiative (SFI)
  - .1 SFI-2010-2014 Standard.
- .6 Ministère des Transports du Québec (MTQ)
  - .1 Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (« CCDG 2019 »).
  - .2 Ouvrages routiers, Normes, Tome VII – Matériaux, norme 11101, Bois.
  - .3 Commission Nationale de Classification des bois de sciage Règles de classification pour le bois d'œuvre canadien

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

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
    - .2 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
    - .3 Wood certificate: Submit manufacturer's traceability chain certificate number, in accordance with CAN/CSA-Z809, FSC or SFI.

#### **1.4 QUALITY ASSURANCE**

- .1 Identify pieces of treated lumber and plywood used in preserved wood foundations by CSA O322 certification stamp.
- .2 Sustainable Standards Certification:
  - .1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809, FSC or SFI.

#### **1.5 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect wood from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse of pallets, crates, padding, banding, packaging materials as specified in Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Lumber shall comply with MTQ 11101 standard:
  - .1 Authorized species are: hemlock, western hemlock, Jack pine, red pine, Douglas fir and yellow pine
  - .2 Lumber elements shall be rated quality No. 1.
- .2 Preservation treatment shall be provided to all lumber elements. Lumber elements shall be treated after being cut according to lengths indicated in the shop drawings. Refer to Section 06 05 73 Wood Treatment.
- .3 Field applied preservatives shall comply with CAN / CSA S406.

### **Part 3 EXECUTION**

#### **3.1 EXAMINATION**

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

#### **3.2 CONSTRUCTION**

- .1 Construct preserved wood foundation in accordance with CAN/CSA-S406.
- .2 Bolts, lag bolts and threaded rods shall be provided with washers or steel pads at each end in contact with the assembled pieces of lumber.
- .3 The pieces of lumber to be assembled with bolts and threaded rods shall be drilled beforehand; the diameter of the hole must be 2 mm larger than that of these hardware parts.
- .4 For assemblies with lag bolts, plugs or nails with a diameter greater than 6 mm, the pieces of lumber to be assembled must be previously drilled; the diameter of the hole must be 2 mm smaller than that of these hardware parts.
- .5 Bolts and lag bolts must be tightened to ensure good contact between the surfaces of all parts to be assembled.
- .6 Any cut, notch, damage or hole of a piece or surface of lumber after treatment must be re-treated with a wood preservative product in accordance with CAN / CSA O80.

#### **3.3 CLEANING**

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

**END OF SECTION**

**PART 1 GENERALITIES**

**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures;
- .2 Section 01 35 29.06 - Health and Safety;
- .3 Section 01 35 43 – Environmental Protection;
- .4 Section 01 61 00 – General Product Requirements;
- .5 Section 01 74 11 - Cleaning;
- .6 Section 01 74 21 – Construction/Demolition Waste Management and Disposal;
- .7 Section 01 78 00 – Closeout Submittals;
- .8 Section 03 30 00 – Cast in Place Concrete;
- .9 Section 32 12 16.01 – Asphalt Paving;
- .10 Section 32 16 15 – Concrete Walks, Curbs and Gutters.

**1.2 REFERENCE STANDARDS**

- .1 ASTM A123/A123M - [09], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
  - .3 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - .4 ASTM B210M, Specification for Aluminum-Alloy Drawn Seamless Tubes.
  - .5 ASTM B211M, Specification for Aluminum and Aluminum-Alloy Bar, Rods and Wire.
  - .6 CGSB1-GP-12c, Standard Paint Colours.
  - .7 CAN/CGSB-1.59, Alkyd, Exterior Gloss Enamel.
  - .8 CAN/CGSB-1.94, Xylene Thinner (Xylol).
  - .9 CAN/CGSB-1.99, Exterior and Marine Phenolic Resin Varnish.
  - .10 CAN/CGSB-1.104, Semigloss Alkyd Air Drying and Baking Enamel.
  - .11 CAN/CGSB-1.132, Zinc Chromate Primer, Low Moisture Sensitivity.
  - .12 CGSB 31-GP-3M, Corrosion Preventive Compound, Cold Application, Soft Film.
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- .13 CGSB 62-GP-11M, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing.

### **1.3 DESIGN REQUIREMENTS**

- .1 Sign supports, fasteners and signs to be capable of withstanding the sum of the wind loads and permanent load of panels, poles and accessories their accessories.
- .2 Structural deflections and vibration in accordance with American Association of State Highway and Transportation Officials (AASHTO), "Specifications for the Design and Construction of Structural Supports for Highway Signs".

### **1.4 SHOP DRAWINGS**

- .1 Submit shop drawings, including the manufacturer's specification sheets, in accordance with Section 01 33 00 - Submittal Procedures.
- .2 The shop drawings must illustrate at a minimum the following items:
  - .1 The materials disposition;
  - .2 The specification sheet;
  - .3 The equipment dimensions;
  - .4 The following equipment characteristics:
    - .1 small signboards;
    - .2 sign supports;
    - .3 fasteners for small signboard.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Sign supports.
    - .1 Steel posts: to CAN/CSA-G40.21, flanged "U" shaped in cross section,
    - .2 Fasteners: bolts, nuts, washers and other hardware for roadside signs to be cast aluminum alloy, or galvanized steel.
  - .2 Signboards
    - .1 Aluminum sheet: to ASTM B209M, precut to required dimensions. Thickness to be 1.5 mm for signboards up to 450 mm wide. Thickness to be 2.0 mm for signboards 450-900mm wide. Thickness to be 3.1 mm for signboards over 900mm wide.
    - .2 Chemical conversion coating for aluminum: to CGSB 31-GP-101Ma.
    - .3 Primer for aluminum: to CAN/CGSB-1.132.
    - .4 Finish paint: to CAN/CGSB-1.59.
    - .5 Silk screen ink:
      - .1 Transparent or opaque colours: to CGSB 1-GP-12c, and as indicated.
    - .6 Reflective sheeting and tape: to CGSB 62-GP-11M. Adhesive, class of reflectivity and colour as indicated.
-

- .7 Transparent tape: flexible, smooth-surfaced, moisture resistant tape with pressure sensitive adhesive.
- .8 Clear varnish protective coat: to CAN/CGSB-1.99.

## **2.2 FABRICATION**

- .1 Signboards
  - .1 Aluminum blanks:
    - .1 Degrease, etch and bond with chemical conversion coating.
    - .2 Clean surfaces with xylene thinner. Dry.
    - .3 For non-reflective signs, spray face with one coat vinyl pre-treatment coating and two finish coats of required colour.
    - .4 For aluminum signboards that are to be painted before installation, spray and bake face of signboards with two coats of enamel in accordance with CAN/CGSB-1.104.
  - .2 Reflective background sheeting and lettering:
    - .1 Cut and apply in accordance with manufacturer's instructions.
    - .2 Apply adhesive coated material with heat lamp vacuum applicator or by squeeze roll application method. Apply pressure sensitive material with roller or squeegee.
    - .3 Edge wrap sheeting on each extrusion prior to bolting extrusions. Match pieces of sheeting from different rolls for each signboard to ensure uniform appearance and brilliance by day and night.
    - .4 Reflective signboard faces may be prepared using silk screen transparent ink.
  - .3 Non-reflective lettering and symbols: cut from vinyl film as specified in CGSB 62-GP-9M, or paint using required colour of finish paint or silk screen transparent ink.
  - .4 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.
  - .5 Protect finished signboard faces with one coat of clear varnish.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Sign support.
  - .1 Single channel steel posts:
    - .1 Drive to required depth without damage to posts.
    - .2 If rock or concrete is encountered, drill hole to required depth and set post in sand.
    - .3 In finished concrete surfaces, backfill with concrete or grout. Protect from adverse conditions until cured.

.2 Signboard

.1 Fasten signboards to supporting posts and brackets as indicated.

### **3.2 CORRECTING DEFECTS**

.1 Correct defects, identified by PCA Representative, in sign message, consistency of reflectivity, colour or illumination. Correct angle of signboard and adjust luminaire aiming angle for optimum performance during night conditions to approval of PCA Representative.

### **3.3 REMOVAL AND SALVAGE**

.1 Carefully dismantle and salvage aluminum and steel materials.

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 35 29.06 – Health and Safety;
- .2 Section 31 05 16 – Aggregate Materials;
- .3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

### **1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM).
  - .1 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
- .2 Canadian Standards Association (CSA)/CSA International.
  - .1 CSA-A23.1/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .3 Ministry of Transport of Quebec (MTQ):
  - .1 Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
  - .2 Standard 1101, Classification of Soils, version 2018-12-15;
  - .3 Standard 2101, Aggregates, version 2007-12-15.
- .4 Quebec Bureau of Standardization (BNQ):
  - .1 BNQ 2560-114/2014, Civil Engineering Work – Aggregates.
  - .2 BNQ 1809-300/2018, Construcion Work – Drining Water & Sewer Lines – General Technical Specifications.
- .5 Committee on Standards, Health and Safety in the Workplace (CSST)
  - .1 Canadian Labour Code, Part II, Canadian Health and Occupation Regulations;
  - .2 Health Canada - Workplace Hazardous Material Information System (WHMIS);
    - .1 Specification Sheets.
  - .3 Act respecting the Occupational Health and Safety Laws, Quebec;
  - .4 Quebec Bureau of Standardization (BNQ)

### **1.3 QUALTIY ASSURANCE / REGULATORY REQUIREMENTS**

- .1 Shore and brace excavations, protect slopes and embankments and perform all work in accordance with the most stringent requirements of federal, provincial and municipal regulations
-

- .2 Health and Safety Requirements: take the necessary health and safety measures in accordance with Section 01 35 29.06 - Health and Safety Requirements. Health and Safety shall be in accordance with local, regional, provincial and federal requirements

#### **1.4 EXISTING CONDITIONS**

- .1 Examine the geotechnical report document no. 025-B-0020632-1-GE-R-0001-01 prepared by Englobe and dated April 2019, that has been included in Appendix 3.
  - .2 Refer to Section 31 23 33.01 Excavation, Trenching and Backfilling, article 3.6 - Dewatering and Heave Prevention in Excavations.
  - .3 Buried Services
    - .1 The Contractor shall take all necessary precautions to identify, protect and replace, as required, all existing structures and structures to be preserved (poles, conduits and electrical wires, telephone or other, frames, covers and grills on catch basins and manholes, buildings, benches, any and all signage, fences of any kind, fountains (source of water), urban furniture, landscaping, trees, shrubs, vegetation, etc.), whether or not shown on the plans and if they are on private land or within street rights of way, whether aerial or underground.
    - .2 All costs incurred by the Contractor for the identification, protection and replacement of all such works (if damaged by the work) are deemed to be included in the tender
    - .3 The Contractor shall, in all cases, notify the PCA Representative of any damage that he has caused or danger that has been created by or in connection with his work.
    - .4 The Contractor is responsible for identifying the location of all overhead and underground services (Hydro-Québec, Bell, Cable, pipeline, etc.) before starting work. The Contractor must notify the PCA Representative of any variations between the actual location and the location indicated on the plans, so that the latter can make the required modifications, if necessary. In this case, no work can be started until the PCA Representative has given his approval.
    - .5 All costs for the support of underground conduits, temporary relocation and/or temporary support of poles, temporary raising of electrical wires or any other intervention by public utility companies will be, if necessary, the responsibility of the Contractor and are deemed to be included in the bid.
    - .6 The alignment and depth of the existing pipes, if shown on plans are approximate. The Contractor is responsible for performing, at his own expense, all exploratory surveys required prior to the commencement of work to validate the exact position and depth of the existing piping at the connection and crossover points with the planned pipelines. This activity
-

must be done in the presence of the Parks Canada Representative. Any situation resulting in an amendment to the plans and specifications must be sent to the Parks Canada Representative in writing as soon as possible. The latter will then indicate to the Contractor if any changes are to be made to the elevation and alignment of the proposed works. The Contractor must comply at no additional cost to Parks Canada.

- .4 The Contractor shall note that the existing public utilities identified on the plans are approximate and may not always be present, which is why the Contractor must locate all services on or near the site.
- .5 If the existing signs interfere with the Contractor's work, the Contractor must temporarily remove and replace the item. Following removal, the Contractor must protect the signaling elements from any damage. In addition, the Contractor must identify the initial location of the signage in order to reposition the signage at the same location or at a location approved by the PCA Representative.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 The granular materials shall be in accordance with the standard BNQ 2560-114/2014, Civil Engineering Work – Aggregates and in accordance with Section 31 23 33.01 Excavating, Trenching and Backfilling.
- .2 Excavation or grading materials available on site can only be used as a backfill material if it is approved in advance by the PCA Representative. Protect approved materials from any form of contamination.
- .3 Excavation materials available on site may not be used as a coating material or as a granular foundation material.

## **PART 3 EXECUTION**

### **3.1 PREPARATION/PROTECTION**

- .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 waterways, properties and walkways, according to the requirements as outlined in MTQ's CCDG 2019 – Section 10.4 and BNQ 1809-300/2018 – Section 5.4.
    - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
    - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
-

- .2 Preparation/Protection
  - .1 Protect excavations from freezing.
  - .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 Parks Canada Representative approval.
  - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
  - .5 Protect buried services that are required to remain undisturbed.
- .3 Removal Work
  - .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
  - .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade.
  - .3 Remove obsolete buried pipes less than 2 m from foundations and close the cut sections with female plugs.
  - .4 If a tree needs to be relocated, cut or pruned, the Contractor shall, following the approval of the PCA Representative, replant the tree in the designated area.

### 3.2 EXCAVATION

- .1 Support and brace excavations, protect slopes and embankments, and perform all work in accordance with current standards in place.
  - .2 Remove topsoil over areas to be covered by new construction, over areas where grade changes are required, and over areas where excavated material is to be deposited. Avoid moving soil near trees that should remain in place, except to remove grass when necessary
    - .1 Stockpile topsoil on site for later use.
  - .3 Carry out the excavation work necessary for the execution of earthworks, regardless of the nature of the materials encountered.
    - .1 Do not disturb soil or rock below bearing surfaces.
    - .2 Notify the Parks Canada Representative when excavations are complete.
    - .3 If bearing capacity of the soil is unsatisfactory, additional excavation will be authorized in writing and paid in accordance with the fixed terms in the contractual documents. If, however, the bearing capacity of the soil is unsatisfactory as a result of the Contractor's work method, the costs incurred by the Contractor to carry out the additional excavation will be at the expense of the Contractor.
    - .4 In areas where the excavation is taken below the depths shown on the drawings, without the written authorisation of Parks Canada Representative, these areas shall be filled with concrete of the same strength as for footings at Contractor's expense.
    - .5 Excavate for slabs and paving to subgrade levels.
-

- .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

### **3.3 OVER-EXCAVATION**

- .1 Clear areas as indicated on drawings. If topsoil is present as a result of the excavation of existing materials, the Contractor must over-excavate the existing materials until a surface of sound materials is obtained.
- .2 Wait for approval of PCA Representative before backfilling.
- .3 Backfilling must be done according to the types of materials and the thickness as indicated on the plans. For backfilling in areas where excavation occurred to greater depths than anticipated, placement of Class B backfill material is permitted.

### **3.4 BACKFILLING**

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Parks Canada Representative.
  - .2 Harmful materials: clear areas for backfilling of construction debris, organic material and standing water.
  - .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
  - .4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill.
    - .1 Fill excavated areas with materials specified on the plans, and compact as specified for the fill material.
  - .5 Placing:
    - .1 Place backfill, fill and basecourse material in 150 mm lifts: add water as required to achieve specified density
  - .6 Compaction: Compact each layer of material to the following densities for materials in accordance with standard ASTM D698.
    - .1 Up to the foundation base course: 95 %.
    - .2 Foundation base courses: 98 %.
    - .3 Foundation for borders, sidewalks and slab on grade, etc.: 98 %.
    - .4 Foundation for catchbasins, catchbasin manholes, pipes, etc.: 90 %.
    - .5 Elsewhere: 90 %.
  - .7 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
  - .8 Materials coming from excavation of rock, and not suitable for finished grading are not acceptable and must be covered with imported material.
-



- .9 Foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material shall not contain stones larger than 200 mm diameter within 600 mm of structures.

### **3.5 GRADING**

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Parks Canada Representative.
- .1 Grade to be gradual between finished spot elevations shown on drawings.

### **3.6 FIELD QUALITY CONTROL**

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by the PCA Representative.
- .2 No later than one (1) week before the start of backfilling and filling, provide the PCA Representative and the designated testing agency with granulometric analyses of materials to be installed.
- .3 Do not begin backfilling or filling operations until material has been approved for use by the PCA Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, the Contractor shall notify the Parks Canada Representative so that compaction tests can be carried out by designated testing agency.

### **3.7 STORAGE AND SURPLUS**

- .1 Excavation materials (except topsoil) shall be used for leveling works, as shown on the plans. Surplus excavation materials will be disposed off-site at a site approved for this type of waste material.
- .2 Supply necessary fill to meet backfilling and grading requirements and within minimum and maximum rough grade variances.
- .3 Dispose of surplus material off site at a site approved for this type of waste material.

### **3.8 CLEANING**

- .1 Perform the cleaning work to keep the site clean and free of materials on the surrounding premises.

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures;
- .2 Section 01 61 00 – General Product Requirements;
- .3 Section 01 74 11 - Cleaning;
- .4 Section 31 00 00.01 – Earthworks;
- .5 Section 31 23 33.01 – Excavating, Trenching and Backfilling;
- .6 Section 32 11 16.01 – Granular Sub-Base;
- .7 Section 32 11 23 – Aggregate Base Courses;
- .8 Section 32 12 16 – Asphalt Paving.
- .9 Despite the preceding list, it is the responsibility of the Contractor to obtain a copy of all sections of this specification even if they do not appear relevant to its specialty. The Contractor implicitly acknowledges that he accepts the clauses and instructions of all sections of the specifications, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections included in this specification.

### **1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials (ASTM) :
  - .1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Ministry of Transport of Quebec (MTQ) :
  - .1 Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
  - .2 Standard 1101, Classification of Soils, version 2018-12-15;
  - .3 Standard 2101, Aggregates, version 2007-12-15.

### **1.3 DOCUMENTS/ SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Specification Sheets
    - .1 Submit specifications sheets required as well as manufacturer documentation regarding aggregates. Specifications sheets must indicate product characteristics, performance criteria, dimensions, constraints and finish.
-

- .3 Samples
  - .1 Submit samples as required at least two (2) weeks prior to the commencement of work
  - .2 Take necessary measures to allow continual sampling of the aggregates by the Parks Canada Representative during the execution of the work.
  - .3 For sampling purposes, ensure that the Parks Canada Representative has access to the source of supply and to prepared materials.
  - .4 Pay the costs associated with sampling and testing of aggregates which fail to meet specified requirements.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – General Product Requirements and in accordance with manufacturer’s written instructions.
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
- .3 Fine aggregate satisfying the requirements of the relevant section shall consist of one of the following materials or a mixture thereof:
  - .1 Natural sand;
  - .2 Artificial or manufactured sand;
  - .3 Screenings produced from crushing quarried rock, boulders, gravel or slag.
- .4 Course aggregate satisfying the requirements of the relevant section shall consist of one of the following materials or a mixture thereof:
  - .1 Crushed rock;
  - .2 Gravel and crushed gravel consisting of naturally formed particles of stone.

#### **2.2 SOURCE QUALITY CONTROL**

- .1 Inform the PCA Representative of proposed source of the aggregates and provide access for sampling at least two (2) weeks prior to commencing the work.
-

- .2 If, in the opinion of the PCA Representative, the materials from the proposed source do not meet, or cannot reasonably be processed to meet the specified requirements, locate an alternative source, or demonstrate that the material from the source in question can be processed to meet specified requirements.
- .3 Advise the PCA Representative in advance of any proposed change to the material source.
- .4 Acceptance of the material at the source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or more importantly if its field performance is found to be unsatisfactory.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
  - .1 Visually inspect substrate in presence of the PCA Representative.
  - .2 Inform the PCA Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with topsoil stripping. only after unacceptable conditions have been remedied and after receipt of approval to proceed from PCA Representative.

#### **3.2 PREPARATION**

- .1 Topsoil stripping:
    - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
    - .2 Begin topsoil stripping of areas as indicated on the drawings.
    - .3 Strip topsoil to depths as indicated on the drawings. Avoid mixing topsoil with subsoil.
    - .4 Stockpile in locations as directed by PCA Representative. Stockpile height not to exceed 1.5 m.
  - .2 Aggregates Preparation:
    - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
    - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by the Parks Canada Representative.
    - .3 If required, wash aggregates to meet specification requirements.
    - .4 When operating in stratified deposits use excavation equipment and methods that permit the production of uniform, homogeneous aggregate.
  - .3 Handling:
    - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
-

- .4 Stockpiling:
  - .1 Unless otherwise indicated, stockpile the aggregate on site in locations as indicated. Do not stockpile aggregate on completed asphalt surfaces.
  - .2 Stockpile aggregates in quantities that will be sufficient to meet the project schedule.
  - .3 The aggregate needs to be stockpiled on sites that are level and well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Unless the materials are stacked on an acceptable stabilized surface, the base of the pile shall consist of a layer of compacted sand at least 300 mm thick to prevent contamination of aggregates. Put the aggregates in a heap on the ground, but do not incorporate the layer of 300 mm thick material at the base of the pile into the executed work.
  - .5 Separate different aggregates by using sturdy, full height partitions, or stockpile the materials far enough apart to prevent intermixing.
  - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by PCA Representative within 48 hours of rejection.
  - .7 Stockpile materials in uniform layers of thickness as follows:
    - .1 Maximum 1.5 m for coarse aggregate and base course materials.
    - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
    - .3 Maximum 1.5 m for other materials.
  - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .9 It is forbidden to stockpile material into cone-shaped piles or allow the material to spill on the sides of the stockpiled material.
  - .10 Do not use conveying stackers.

### **3.2 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 00 - Cleaning.
  - .3 Clean the area where the aggregate had been stockpiled in a way that will leave the site clean, well-drained and with no accumulation of stagnant water.
  - .4 Leave any unused aggregates in neat compact stockpiles as directed by PCA Representative.
  - .5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
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- .6 Restore surfaces used for stockpiling to their original condition.

**FIN DE SECTION**



## **PART 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 02 41 13 - Selective Site Demolition
- .2 Section 31 00 00.01 – Landscaping.
- .3 Section 32 01 90 33 – Tree and Shrub Preservation.

### **1.2 REFERENCES**

- .1 Bureau de normalisation du Québec - NQ 0605-200 - Entretien arboricole et horticole.
- .2 Normes de bonne pratique de la Société internationale d'arboriculture Québec (SIAQ).

### **1.3 DEFINITIONS**

- .1 Clearing consists of cutting off trees, shrubs and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Isolated cutting of trees consists of cutting off trees to not more than specified height above ground and disposing of felled trees and debris.
- .3 Grubbing consists of removing stumps and roots to a depth below the existing surface level not less than as prescribed and disposing of the stumps and roots.

### **1.4 STORAGE AND PROTECTION**

- .1 Prevent damage to fencing, existing trees and shrubs to be kept, landscaping, natural features, bench marks, existing pavement, utility lines, site appurtenances, water courses and root systems of trees which are to remain.
  - .1 Repair damaged items to approval of PCA Representative.
  - .2 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 PCA Representative shall determine the cost without recourse.

### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
  - .1 Trim limbs and tops, and saw into saleable lengths.
  - .2 Trim limbs and tops, and saw into saleable lengths.
- .3 Dispose of sick trees off site and burn. PCA Representative will determine on site which trees are to be disposed of.
- .4 All felled trees must be transported to site mobilization site. The Contractor shall carry out the evacuation site from the mobilization site,



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## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Soil Material for Fill:
  - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
  - .2 Remove and store soil material for reused.

## **PART 3 EXECUTION**

### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and the sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.2 PREPARATION**

- .1 Inspect site and verify with PCA Representative items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
  - .1 Notify PCA Representative immediately of damage to or when unknown existing utility lines are encountered.
  - .2 When utility lines which are to be removed are encountered within area of operations, notify PCA Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

### **3.3 APPLICATION**

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

### **3.4 CLEARING**

- .1 Clearing includes felling, trimming, cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, rubbish occurring within cleared areas.
- .2 Clear as directed by PCA Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

### **3.5 ISOLATED TREES**

- .1 Cut off isolated trees as directed by PCA Representative at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps at PCA Representative's request.

### **3.6 GRUBBING**

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 300 mm below ground surface.

### **3.7 REMOVAL AND DISPOSAL**

- .1 Remove cleared and grubbed materials off site.
- .2 Dispose of cleared and grubbed materials.
- .3 Chip and mulch cleared and grubbed vegetative material.  
The Contractor may use wood chips to reduce compaction of roots or to control surface water. Wood chips must be removed once landscaping work is completed.
- .4 Remove diseased trees identified by PCA Representative and dispose of this material to approval of PCA Representative. Apply strict control to the disposal of elms, due to Dutch Elm disease and butternut canker. Remove all parts of elm trees that have been cut, including the trunk, to an authorized disposal facility and provide proof to PCA Representative.
- .5 Because of the emerald ash borer, any tree identified as such is subject to stringent control measures regarding the disposal of ash trees. The Contractor must collect all felled wood including the stump and transport to an authorized facility and provide proof to the PCA Representative for verification.
  - .1 Ash waste such as branches and logs with a diameter not exceeding 20 cm must be shredded immediately on site during pruning or felling. Chip size must not exceed 2.5 cm on at least two sides.
  - .2 Ash waste such as branches and logs with a diameter exceeding 20 cm:
    - .1 After felling and pruning, the Contractor must collect all the wood and transport it to an authorized facility for treatment.  
Or
    - .2 Sent to a wood processing facility or kept on site and transformed using a suitable process after felling and pruning.

**3.7 REMOVAL AND DISPOSAL (cont'd)**

- .3 In other cases, the Contractor must provide proof of the uses and movements for verification by the PCA Representative.
- .4 Fell ash trees between September 15 and April 15.

**3.8 FINISHED SURFACE**

- .1 Leave ground surface in condition suitable for immediate grading operations and stripping of topsoil to approval of PCA Representative.

**3.9 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

## **PART 1 GENERALITIES**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures;
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal;
- .3 Section 31 00 00.01 – Earthworks;
- .4 Section 31 05 16 – Aggregate Materials;
- .5 Section 32 91 19.13 – Topsoil Placement and Grading.

### **1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM) :
  - .1 ASTM C 117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D 698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>2</sup>) (600 kN-m/m<sup>2</sup>).
  - .5 ASTM D 1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>2</sup>) (2,700 kN-m/m<sup>2</sup>).
  - .6 ASTM D 4318-10e1, 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 CAN 3-A23-1M77, Concrete Materials and Methods of Concrete Construction.
- .3 Association canadienne de normalisation (CSA)/CSA International :
  - .1 CAN/CSA-A3000-[13], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .2 CSA-A23.1/A23.2-[14], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 Quebec Bureau of Standardization (BNQ):
  - .1 CAN/BNQ 2501-250, Soils - Determination of water content-density relationship - Test with normal compaction energy (600 kN.m / m<sup>3</sup>)
  - .2 CAN/BNQ 2501-255, Soils - Determination of water content-density relationship - Test with modified compaction energy (2 700 kN m/m<sup>3</sup>).
  - .3 BNQ 2560-114/2014, Civil Engineering Work – Aggregates.

- .4 BNQ 1809-300/2018, Construciton Work – Drining Water & Sewer Lines – General Technical Specifications.
- .5 BNQ 1809-900/2019, Travaux de construction – Ouvrages de génie civil - Clauses administrative générales
- .5 Ministry of Transport of Quebec (MTQ) :
  - .1 Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
  - .2 Standard 1101, Classification of Soils, version 2018-12-15;
  - .3 Standard 2101, Aggregates, version 2007-12-15.

### 1.3 DEFINITIONS

- .1 Excavation classes: [two] classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: solid material in excess of 1.25 m<sup>3</sup> and which cannot be removed by means of heavy-duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136 and ASTM D422. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2].

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

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

#### 1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION

- .1 Quality Control:
  - .1 Submit required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit a report on existing conditions, if requested by the PCA Representative.
  - .3 Submit for review by the PCA Representative, the proposed dewatering and heave prevention methods.
  - .4 Submit to the PCA Representative written notice at least seven (7) days prior to excavation work, to ensure cross sections are taken.
  - .5 Submit to PCA Representative written notice when bottom of excavation is reached.
  - .6 Submit to the PCA Representative results and inspection reports.
- .2 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field.
- .3 Samples
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Inform PCA Representative at least four (4) weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

#### 1.5 QUALITY ASSURANCE

- .1 Engage services of qualified professional Engineer who is registered or licensed in Province of Quebec, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

#### 1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Send excess aggregate materials to a local facility for reuse as directed by the PCA Representative.

## 1.7 EXISING CONDITIONS

- .1 Examine the geotechnical report document no. 025-B-0020632-1-GE-R-0001-01 prepared by Englobe and dated April 2019, that has been included in Appendix 3.
- .2 Buried services:
  - .1 Before commencing work verify and determine the location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to beginning excavation Work, determine the location as well as the state of existing buried utilities and structures and notify the PCA Representative. The PCA Representative must clearly mark such locations to prevent disturbance during Work.
  - .6 Confirm locations of buried utilities by careful test excavations.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .8 Where utility lines or structures exist in area of excavation, obtain direction of the PCA Representative before removing.
  - .9 Record location of maintained, re-routed and abandoned underground lines.
  - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
  - .1 Conduct with the PCA Representative, a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately repair as directed by the PCA Representative.
  - .3 Where required for excavation, cut roots or branches as directed by the PCA Representative in accordance with Section 32 01 90.33 - Tree and Shrub Preservation.

## 1.8 CONTAMINATED SOIL MANAGEMENT - GENERAL

- .1 Excavate and manage the contaminated soils encountered in accordance with the applicable regulations and in accordance with Section 01 35 43.
- .2 Consider wait times associated with environmental remediation, such as sampling, waiting for test results, segregation of soils, etc.
- .3 Manage site activities so that the health and safety of the public and staff and the protection of the environment always take precedence over cost and schedule issues.

- .4 Temporarily store potentially contaminated soils in areas authorized by the PCA Representative for reuse for backfilling in trenches if permitted. Storage should be on watertight canvases. The heaps of materials will also have to be covered with waterproof canvas.
- .5 Provide the PCA Representative with a written statement from the owner or authorized site manager where the contractor plans to ship the contaminated material. This certificate must certify the acceptance to receive these materials and that it is authorized by the Ministry of the Environment Against Climate Change (MELCC) for this purpose.
- .6 Limit the spread of dust and clean equipment that will be in contact with contaminated soil. The cleaning must take place at the end of the work, before leaving the premises, all according to the applicable standards. Dispose of cleaning residues (water, soil, etc.).
- .7 Use sealed trucks with protective covers to prevent dispersion during transport.
- .8 Install a polyethylene membrane along the bucket panels if the material is wet to keep the water inside it.
- .9 Laboratory analysis for contaminated soil will be conducted by Parks Canada or their representative once the material is temporarily stored to the satisfaction of the PCA Representative.
- .10 Unless the contractor is the cause, all additional operations required by the PCA representative related to contaminated soil encounter will be dealt with by Change Notice.

## **1.9 MANAGEMENT OF REUSABLE CONTAMINATED SOIL**

- .1 Prioritize on-site reuse of contaminated soils of Category A-B and B-C for backfilling trenches, all of which will follow stockpiling and analysis of such contaminated soils.
  - .1 When the soils being reinstalled exceed MELCC category B, apply a minimum of 30 cm of clean soil (<A) over it.
  - .2 Where excavated soil is reused elsewhere than in the trench from which it originates, it may not be placed on top of better-quality soil.
  - .3 No increase in contamination of a sector is allowed.
- .2 Under slabs for water fountains and water parks, no contaminated material superior to Category B can be present in these locations.
- .3 For trench backfilling, no contaminated material higher than Category C may be used to replace Class B material.
- .4 All surplus material of Category A-B et B-C, not used for backfilling trenches must be transported and deposited to areas indicated by the PCA Representative. All of this must include the placing of the material in piles, transportation of the material to the designated area, the removal of topsoil if required, the placement, levelling, drainage and compaction of the relocated materials as indicated by the PCA Representative.



## 1.10 MANAGEMENT OF NON-REUSABLE CONTAMINATED SOIL

- .1 Load, transport and dispose of contaminated soils to a site authorized by the Ministry of the Environment Against Climate Change (MELCC), all for the purpose of environmental rehabilitation of the site. This to include soils contaminated beyond Category C in accordance with the Ministry of the Environment Policy, all this following the stockpiling and analysis of such soils.
- .2 Provide, for each load of contaminated soil, a transport manifest indicating, among other things, the degree of contamination of the materials. All such loads will have to be weighed, and the weigh tickets as well as the shipping manifests must be duly completed by the receiving site manager and shall be delivered to the PCA Representative.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- .1 Source and Quality:

The aggregate must come from the crushing of the stone. It must be free of soil, frozen lumps and foreign materials such as clay, organic materials, oils and other wastes in accordance with CAN 3-A23-1M77.

- .2 Granular base MG 20 (20 - 0 mm) : This natural crushed stone must be clean, angular and free from shale, clay, powdery material, roots and vegetable matter. The particle size of this type of stone must respect the limits of the following table as stipulated in the BNQ 2560-114 standard:

Sieve Designation	% Passing
20 mm	90 – 100
14 mm	68 – 93
5 mm	35 – 60
1,25 mm	19 – 38
0,315 mm	9 – 17
0,080 mm	2 - 7

The Contractor must provide a granulometric analysis from a laboratory and submit to the PCA Representative for approval. The cost of the analysis is at the expense of the Contractor.

- .3 Granular base MG 56 (56 - 0 mm) : This natural crushed stone must be clean, angular and free from shale, clay, powdery material, roots and vegetable matter. The particle size of this type of stone must respect the limits of the following table as stipulated in the BNQ 2560-114 standard:

Sieve Designation	% Passing
80 mm	100
56 mm	82-100
31,5 mm	55-85
5 mm	25-50
1,25 mm	11-30
0,315 mm	4-8
0,080 mm	2 - 7

- .4 Compliant backfill material MG-112: This material shall be clean and does not contain shale and stone particles larger than 100 mm in diameter. A unified soil classification SP-SM containing between 20% and 30% of silt, free of debris and draining, makes it possible to reach this objective.
- .5 Sub-fondation MG-112: This material must come from a sand pit. The particle size of this type of stone must respect the limits of the following table as stipulated in the BNQ 2560-114 standard:

Sieve Designation	% Passing
112 mm	100
5 mm	12 – 100
0,080 mm	0 - 10

- .6 Stone screenings: Crushed stone (5-0 mm), limestone screenings which must be as close as possible to the particle size indicated in the following table :

Sieve Designation	% Passing
10 mm	100
5 mm	95 – 100
2,5 mm	75 – 80
1,25 mm	55 – 65
0,63 mm	40 – 50
0,35 mm	25 – 35
0,16 mm	20 – 25
0,08 mm	10 – 17

The Contractor must provide a granulometric analysis from a laboratory and submit to the PCA Representative for approval. The cost of the analysis is at the expense of the Contractor.

- .7 Compliant Class «B» backfill material: This material shall be clean, not containing shale and stone particles greater than 100 mm in diameter. A unified SP-SM soil classification containing less than 25% passing the 80 micron sieve, free of debris, makes it possible to reach this objective.

## **PART 3 EXECUTION**

### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to CCDG 2019 (MTQ) – Section 10.4 et aux exigences du BNQ 1809-300/2018 – Section 5.4 and must comply with the requirements of other applicable codes, standards and regulations in effect.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
- .3 Obtain all necessary permits to carry out the work, including but not limited to disposal of waste by burning or other methods

### **3.3 PREPARATION /PROTECTION**

- .1 Protect existing features in accordance with contractual documents.
- .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 PCA Representative.
- .4 Protect natural and man-made features required to remain undisturbed.
- .5 Protect buried services that are required to remain undisturbed.
- .6 Take care not to excavate or backfill the root system of the trees to be preserved. Take the necessary measures to protect the space by projecting the crown to the ground.

### **3.4 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping in the areas indicated on the plans.
- .2 Remove topsoil to depths as indicated on the plans
  - .1 Do not mix topsoil with subsoil.
- .3 Stockpile topsoil in areas indicated by the PCA Representative.
  - .1 Stockpile height not to exceed 1.5 m and should be protected from erosion.
- .4 Dispose of unused topsoil to a location as indicated by the PCA Representative.

### **3.5 STOCKPILING**

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

### **3.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while work is in progress.
- .2 Provide the details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs to the PCA Representative for review.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 The Contractor must consider that possible groundwater infiltration may occur during excavation work, mainly during the navigation season.
- .6 Dispose of water in a manner that does not pose a risk to public or private properties, or to any part of the completed or ongoing work.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .7 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### **3.7 EXCAVATION**

- .1 It is understood that no special compensation will be paid to the Contractor for the snow removal work when required.
- .2 Advise the PCA Representative at least seven (7) days before commencing excavation work, for initial cross sections to be taken.
- .3 Excavate to lines, grades, elevations and dimensions as indicated on the plans or determined by the PCA Representative.
- .4 Remove all obstructions encountered during excavation
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 Unless authorized by the PCA Representative in writing, it is prohibited to dig more than 30 meters of trench before proceeding with the installation of the elements to be buried, and the length of unembedded trench shall not exceed 15 meters, at the end of a working day.
- .7 Keep excavated and stockpiled materials a safe distance away from the edge of trench as directed by PCA Representative.

- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material in approved location designated by the PAC Representative in accordance with all applicable provincial and municipal regulations.
- .10 Avoid obstructing the flow of runoff or natural watercourses. Ensure the control and evacuation of rainwater, snowmelt water, groundwater, sewage and water from any other source on the site to allow the execution of the work.
- .11 Earth bottom of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify PCA Representative when bottom of excavation is reached.
- .13 Obtain PCA Representative approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the PCA Representative.
- .15 Excavation must not interfere with bearing capacity of adjacent foundations.
- .16 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .17 Take the necessary precautions to eliminate the production of dust.
- .18 Where applicable, install geotextiles in accordance with manufacturer's requirements.
- .19 The slope of the excavation walls must be at least 1 horizontally to 1 vertically, to ensure the stability of the walls.
- .20 Complete excavations by hand, firm up and remove all loose materials and debris.
- .21 Keep excavations dry at all times and provide appropriate equipment when necessary.
- .22 All unusable excavation material will be removed off-site to the satisfaction of the PCA Representative. If the deposit site chosen by the Contractor requires soil testing. The Contractor shall include in his site organization price the costs related to his tests.
- .23 Comply with any specific requirements established by the PCA Representative for archaeological monitoring. In the case where archaeological monitoring is not required for the works and archaeological remains (remains of construction or development, objects and fragments of objects) are the subject of a fortuitous discovery during excavation, the Contractor must suspend work in the immediate area of discovery and notify the PCA Representative, who will then take the necessary steps to protect and preserve the said archaeological remains. During this time, work must continue in another area.

### **3.8 FILL TYPES AND COMPACTION**

- .1 Use fill materials of the type indicated or prescribed on the drawings. Compaction densities are percentages of maximum densities calculated according to ASTM D1557.

### **3.9 MATERIALS FOR BEDDING AND COVER FOR UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and cover around underground services as indicated on drawings.

- .2 The materials for the foundation and cover around underground services in the excavation must not be frozen.

### **3.10 BACKFILLING**

- .1 When applicable, all materials must come from sites authorized under the Regulation respecting quarries and sand pits.
- .2 Use clean backfill material free from contaminants and undesirable species.
- .3 Materials used as backfill must be analyzed by a recognized laboratory and accepted by the PCA Representative before it is put in place.
- .4 Do not proceed with backfilling operations until completion of following:
  - .1 PAC Representative has inspected and approved installations.
  - .2 PCA Representative has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .5 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .6 Do not use backfill material which is frozen or contains ice, snow or debris.
- .7 Excavation materials may be used for backfilling if they are deemed fit for use and having been analyzed by a laboratory and approved by the PCA Representative.
- .8 Before placing backfill material, remove soft surfaces from the ground and compact the bottom of the excavation to the specified compacting density.
- .9 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .10 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 48 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed work to equalize loading.
- .11 Place fill in areas as indicated.
- .12 Where indicated, install the drainage system in the backfill.

### **3.11 RESTORATION**

- .1 Upon completion of the 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 PCA Representative.
- .2 Reinstate grass to elevations which existed before excavation.
- .3 Reinstate pavement and sidewalks affected by the work in the condition and level they were at before the start of the work, taking care to respect the original thickness of the works.

- .4 Clean and reinstate areas affected by the work as directed by the PCA Representative.
- .5 Protect newly graded areas from erosion and circulation of traffic. Maintain free of trash or debris.

**END OF SECTION**

## **PART 1      GENERALITIES**

### **1.1          RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures;
- .2      Section 01 74 11 - Cleaning;
- .3      Section 01 74 21 – Construction/Demolition Waste Management and Disposal;
- .4      Section 31 23 33.01 - Excavating, Trenching and Backfilling;
- .5      Section 32 12 16.01 - Asphalt Paving;
- .6      Section 32 91 19.13 - Topsoil Placement and Grading.

### **1.2          REFERENCE STANDARDS**

- .1      ASTM International
  - .1      ASTM D 698-[07ea1], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft<sup>2</sup>) (600 kN-m/m<sup>2</sup>).
- .2      American Association of State Highway and Transportation Officials (AASHTO)
  - .1      AASHTO T99-[10], Standard Method of test for Moisture-Density Relations of Soils Using a 2.5 kg (5.5lb) Rammer and 305 mm (12 in) Drop.
- .3      Canadian Green Building Council (CGBC)
  - .1      LEED Canada-NC, version 1.0 - 2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).
  - .2      LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design) : Green Building Rating System for New Construction and Major Renovations 2009;
  - .3      LEED Canada-CI, version 1.0- 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors;
  - .4      LEED Canada-BE : E et E 2009, LEED (Leadership in Energy and Environmental Design) : Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.

### **1.3          DEFINITIONS**

- .1      Definitions.
    - .1      Rock Excavation
      - .1      Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot
-



be ripped with reasonable effort with a Caterpillar D9 crawler bulldozer or equivalent to be considered integral with parent mass.

- .2 Boulder or rock fragments measuring in volume 1 cubic metre or more.
- .2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping.
- .3 Unclassified Excavation: excavation of whatever character other than stripping encountered in the Work.
- .4 Free Haul: distance that excavated material is hauled without compensation. Free haul distance to be 0.5]km or less.
- .5 Stripping: excavation of organic material covering original ground.
- .6 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved.
- .7 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
- .8 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.
- .9 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.
- .10 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

#### **1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.

#### **1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements:
  - .1 Adhere to regulations of authority having jurisdiction when blasting is required.
  - .2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Embankment materials require approval by the PCA Representative.
- .2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.
- .3 Borrowed material:
  - .1 Obtain from sources such as quarry, or borrow pit as approved by the Representative.

- .1 Earth Embankment materials to consist of acceptable earth material and processed rock material free from objectionable quantities of organic matter, frozen soil, stumps, trees, moss, and other unsuitable materials.
- .2 Rock Embankment material to consist of fragmented rock produced by drilling and blasting operations, and boulders which cannot be placed in layers as specified for Earth Embankments.
  - .1 Rock Embankment to conform to the following particle size:

<u>Sieve Designation</u>	<u>% Passing by Weight</u>
150 mm	100
100 mm	85 - 100
75 mm	10 - 50
No. 200	*0 - 3
  - .2 \* Gradation is determined by that portion passing the 75 mm screen.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:
  - .1 Visually inspect substrate in the presence of the PCA Representative.
  - .2 Inform the PCA Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the PCA Representative.

#### **3.2 COMPACTION EQUIPEMENT**

- .1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.
  - .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
  - .2 Replace or supplement equipment that does not achieve specified densities.
- .2 Operate compaction equipment continuously in each embankment when placing material.

#### **3.3 WATER DISTRIBUTORS**

- .1 Apply water with the use of equipment capable of uniform distribution.

#### **3.4 STRIPPING OF TOPSOIL**

- .1 Place top soil and finish grading in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

- .2 Commence topsoil stripping of areas as indicated by the PCA Representative after brush, weeds, and grasses have been removed from these areas.
- .3 Strip topsoil to depths as indicated by the PCA Representative. Do not mix topsoil with subsoil.
- .4 Stockpile in locations as indicated by the PCA Representative.
  - .1 Stockpile height: not to exceed 2 m.
- .5 Dispose of unused topsoil to a location as directed by the PCA Representative.
- .6 Remove clearing and grubbing debris from stripping.
- .7 Spread organic stripping, on completion of excavation and embankment construction, on slopes and trim or remove from site if quantity exceeds ability to grade on site.

### 3.5 EXCAVATING

- .1 General
  - .1 Notify the PCA Representative when waste materials are encountered and remove to depth and extent directed.
  - .2 Sub-excavate 500 mm below subgrade in cut sections unless otherwise directed by the PCA Representative.
    - .1 Compact top 150 mm below sub-excavate to minimum 95% maximum dry density, to ASTM D698 and AASHTO T99.
    - .2 Replace with approved embankment material and compact to specified embankment density.
  - .3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by the PCA Representative.
  - .4 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points in accordance with Transport Canada standard plans for "Cut and Fill Construction Methods at Grade Points" as directed by the PCA Representative.
- .2 Drainage:
  - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
  - .2 Provide ditches as work progresses to provide drainage.
  - .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.
- .3 Rock excavation:
  - .1 Notify the PCA Representative, when material appearing to conform to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide 12-hour notification.
- .4 Borrowed Excavation:
  - .1 For backfilling, use all appropriate cuttings from right-of-ways before using borrow material.

- .2 After having used all the material from the right-of-way for backfilling, take the additional cuttings required, from designated borrowed areas.
  - .1 PCA Representative to designate extent of borrowed areas and allowable depth of excavation.
  - .2 Remove waste and stripping material from borrowed pits to designated locations.
- .3 Slope edges of borrowed areas to a minimum 2:1 and provide drainage as directed.
- .4 Trim and leave borrowed pits in a condition to permit accurate measurement of materials removed.

### 3.6 BACKFILLING

- .1 Scarify or bench existing slopes in sloping sections to ensure proper bond between new materials and existing surfaces.
  - .1 Method used to be to be pre-approved in writing by the PCA Representative.
- .2 Break up or scarify existing road surface prior to placing embankment material.
- .3 Do not place material which is frozen, nor place material on frozen surfaces except in areas authorized by the PCA Representative.
- .4 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .5 Drain low areas before placing materials.
  - .1 Place and compact to full width in layers not exceeding 200 mm loose thickness. PCA Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.
- .6 Where material consists of rock:
  - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.
  - .2 Distribute rock material to fill voids with smaller fragments to form compact mass.
  - .3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.
  - .4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of pavement subgrade elevation.
- .7 Deductions from excavation will be made for overbuild of embankments.

### 3.7 COMPACTION

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
  - .2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.
-

- .1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.
- .2 Ensure required compaction for each layer before placing any material for next layer.
- .3 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.
- .4 Obtain written approval from the PCA Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results
  - .1 For tamping rollers, use equipment that exerts 1000 kPa minimum of pressure on tamping surface of each tamping foot in transverse row.
- .5 Compact each layer to minimum 95% maximum dry density: ASTM D698 and AASHTO T99, except top 150 mm of subgrade.
  - .1 Compact top 150 mm to 100% maximum dry density.
- .6 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

### **3.8 FINISHING**

- .1 Shape entire roadbed to within 25 mm of design elevations.
- .2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.
- .3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.
- .4 Hand finish slopes that cannot be finished satisfactorily by machine.
- .5 Round top of backslope 1.5 m both sides of top of slope.
- .6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.
- .7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

### **3.9 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.
-

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.10 PROTECTION**

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by PCA Representative.
- .2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

**END OF SECTION**



## **PART 1      GENERALITES**

### **1.1          RELATED SECTIONS**

- .1      Section 01 61 00 – General Product Requirements;
- .2      Section 01 74 21 – Construction Demolition Waste Management and Disposal;
- .3      Section 31 23 33.01 - Excavating, Trenching and Backfilling;
- .4      Despite the preceding list, it is the responsibility of the Contractor to obtain a copy of all sections of this specification even if they do not appear relevant to its specialty. The Contractor implicitly acknowledges that he accepts the clauses and instructions of all sections of the specifications, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections included in this specification.

### **1.2          REFERENCES**

- .1      American Society for Testing and Materials International (ASTM):
  - .1      ASTM D4355/D4355M, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus.
  - .2      ASTM D 4491 – 99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .3      ASTM D 4595 – 11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .4      ASTM D 4716 – 14, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
  - .5      ASTM D 4751 – 12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
  - .6      ASTM D5199 – 12, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
- .2      Canadian General Standards Board (CGSB):
  - .1      CAN/CGSB-4.2 No. 11.2-[2004], Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
  - .2      CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
- .3      Ministry of Transport of Quebec (MTQ) :
  - .1      Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition.
  - .2      Standard 13101, Geotextiles, version 2018-12-15.

### **1.3          DOCUMENTS/SAMPLES TO BE SUBMITTED**

- .1      Submit required documents/samples at least two (2) weeks before commencing work.
-



- .2 Specification Sheets
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples
  - .1 Submit the following samples two (2) weeks prior to beginning work:
    - .1 Minimum length of [2] m of roll width of geotextile.
    - .2 Methods of joining.
- .4 Rapports des essais et rapports d'évaluation
  - .1 Submit copies of mill test data and certificate at least two (2) weeks prior to start of Work.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- General Product Requirements.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground, and in clean, dry, well-ventilated area.
  - .2 Store and protect geotextiles from direct sunlight and UV rays.
  - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **PART 2 PRODUCTS**

#### **2.1 MATERIAL**

- .1 Geotextiles:
    - .1 Non-woven synthetic fibre fabric, in accordance with MTQ Standard 13101 for Type V geotextile.
    - .2 Supplied in rolls:
      - 1. Width: 3,5 m minimum
      - 2. Length: 100 m minimum.
  - .2 Physical Properties:
    - .1 Thickness: 2,50 mm minimum, in accordance with ASTM D5199.
    - .2 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.
      - 1. Breaking force: minimum 1000 N, wet condition.
      - 2. Elongation at future: minimum 15%.
  - .3 Hydraulic Properties:
    - .1 Filtration opening size (FOS): 81 – 150 micrometers according to CAN/CGSB-148.1 No.10.
-

- .4 Product:
  - .1 Geotextile Membrane Texel 912, Novatex V ou Routex V.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

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

#### **3.2 INSTALLATION**

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and secure them in position by using stone blocks or concrete.
  - .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
  - .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
  - .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
  - .5 Join successive strips of geotextile by using securing pins.
  - .6 Pin successive strips of geotextile with securing pins at 500 mm interval at mid point of overlap.
  - .7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
  - .8 After installation, cover with overlying layer within 4 hours of placement.
  - .9 Replace damaged or deteriorated geotextile to approval of PCA Representative.
  - .10 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
  - .11 Provide the membrane around each concrete structure (manhole, catchbasin, etc.) when the structures are in the pavement or parking. The membrane must be held in place with a minimum of two (2) steel pins. The membrane must have a minimum height of 1.8 m below the level of the finished ground.
-

**3.3 CLEANING**

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Rid construction site of waste and dispose of in an environmentally sound manner in accordance with regulatory requirements.
- .4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.
- .2 Avoid overloading the soil or aggregate that covers the geotextile.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Section 31 32 19.01 - Geotextiles.
- .3 Section 31 23 33.01 - Excavation, Trenching and Backfilling.
- .4 Despite previous enumeration, the Contractor shall obtain a copy of all sections of this specification even if they do not seem relevant to his specialty. The Contractor acknowledges implicitly that he accepts the clauses and prescriptions of all sections of the current specification, even if he fails to consult certain sections. Refer to the table of contents for a complete list of sections.

### **1.2 REFERENCES**

- .1 Unless otherwise indicated, the latest publication and amendments of the following standards prevail on the effective date of the contract.
- .2 American Society for Testing and Materials (ASTM)
  - .1 ASTM A313/A313M, Standard Specification for Stainless Steel Spring Wire.
  - .2 ASTM A764, Standard Specification for Metallic Coated Carbon Steel Wire, Coated at Size and Drawn to Size For Mechanical Springs.
- .3 Canadian Standard Association (CSA)
  - .1 CAN/CSA-G164-M92, Hot dip galvanizing of irregularly shaped articles.
- .4 Ministère des Transports du Québec (MTQ)
  - .1 Standard 14501

### **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 Collect and separate waste in accordance with Waste Management Plan.
  - .3 Place materials defined as hazardous or toxic in designated containers.
  - .4 Fold up metal banding, flatten and place in designated area for recycling.
  - .5 Divert left over aggregate material from landfill to a local quarry or facility as approved by PCA representative.
-

- .6 Divert left over metal materials to a local recycling facility as approved by PCA representative.
- .7 Divert left over geotextiles from landfill to a local plastic recycling facility as approved by PCA representative.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Gabions
  - .1 Gabion baskets:
    - .1 Factory fabricated so that sides, ends, lid and internal diaphragms can be readily assembled at site into rectangular baskets of sizes as indicated.
    - .2 Single unit construction or with joints having strength and flexibility equal to that of mesh.
    - .3 Provide diaphragms of same mesh as gabion walls, when length exceeds horizontal width. Diaphragms to divide basket into equal cells of length not to exceed horizontal width.
    - .4 Wire mesh gabions:
      - .1 Wire mesh: uniform hexagonal pattern wire woven in triple twist pattern with openings of approximately 80 x 100 mm, non-ravelling.
      - .2 Securely selvedge perimeter edges to form joints connecting selvedges with same strength as mesh body.
      - .3 Wire to have following dimensions:
        - .1 Mesh: 3mm diameter wire, PVC covered wire 3.5 mm diameter.
        - .2 Selvedges: 3.8 mm diameter wire, PVC covered wire 3.4 mm diameter.
        - .3 Binding: 2.2 mm diameter.
      - .4 Wire: hot dip galvanized with minimum coverage of 260 g/m<sup>2</sup> to CAN/CSA G164. Cover with minimum 0.5 mm thick polyvinyl chloride coating.
      - .5 Interlocking wire fasteners: stainless steel to ASTM A313.
  - .2 Stone fill:

- .1 Hard, durable, abrasion resistant, capable of resisting degradation from action of wetting and drying, wave action, freezing and thawing cycles.
- .2 Cell filling shall be performed manually with stones complying with MTQ standard 14501. Minimum 100 mm to maximum 200 mm dimension for individual stones.

### **PARTIE 3 EXECUTION**

#### **1.4 INSTALLATION**

- .1 Install gabions and geotextiles to lines and grades as indicated. Follow manufacturer's instructions in assembling baskets.
- .2 Excavate for and backfill behind gabions in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

#### **1.5 PLACING GABIONS**

- .1 Wherever possible, place baskets in position prior to filling with stones.
- .2 Join adjacent baskets together at corners as recommended by manufacturer, to ensure joints are as strong as mesh.

#### **1.6 FILLING BASKETS**

- .1 Tension geogrid gabions according to manufacturer's instructions before filling with stone. Do not release wall tension until sufficient stone fill has been placed to prevent wall slackening.
- .2 On exposed faces of gabions, place stones by hand with flattest surfaces bearing against face mesh to produce satisfactory alignment and appearance.
- .3 For wire mesh gabions, fill gabion cells in lifts not to exceed 300 mm and connect opposite walls with two tie wires after each lift.

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 31 00 00.01 – Landscaping
- .2 Section 32 91 19.13 – Topsoil Placement and Grading
- .3 Section 32 92 23 - Sodding

### **1.2 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 Canadian Nursery Landscape Association (CNLA) (Association canadienne des pépiniéristes et des paysagistes)
- .4 Good practice standards of the Société internationale d'arboriculture Québec (SIAQ).
- .5 Bureau de normalisation du Québec - NQ 0605-200 - Entretien arboricole et horticole.

### **1.3 SCHEDULING**

- .1 Obtain approval from PAC Representative of schedule indicating beginning of Work.

### **1.4 IDENTIFICATION**

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

### **1.5 PROTECTION**

- .1 Do not damage plantings, site features, markers, existing buildings, public utility services that must remain in place. Repair damage.
- .2 The Contractor may use wood chips to reduce compaction of roots or to control surface water. Wood chips must be removed once landscaping work is completed.
- .3 The following is not allowed without written consent from the PAC 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.



## **1.5 PROTECTION (CONT'D)**

- .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.

- .4 Meet with PAC 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.

The procedure will be issued before and during the contract's execution and will be automatically integrated into the contract with now additional financial compensation.

## **1.6 EQUIPMENT MAINTENANCE**

- .1 Keep tools clean and sharpened thorough pruning work. Do not use tools that crush or tear bark.
- .2 Disinfect tools before pruning a new tree.
- .3 Disinfect tools when using on diseased trees.

## **PART 2 PRODUCTS**

### **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 PAC Representative.
  - .5 White geotextile.
  - .6 Steel rod or stake, 600 mm.

## **2.1 MATERIALS (cont'd)**

- .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 Solution à 20 % d'hypochlorite de sodium ou solution à 70 % d'alcool éthylique.
- .6 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.
- .7 Welded wire fabric (WWF): 100 x 100mm, to CSA G30.5.
- .8 Wood posts: 38 x 89 x 2400 mm length.
- .9 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 PAC Representative before use as fill.
- .10 Coarse washed stones: 35-75 mm diameter clean round hard stone.

## **PART 3 EXECUTION**

### **3.1 IDENTIFICATION AND PROTECTION**

- .1 Identify with PAC Representative plantings to be preserved and protected. Apply measures as indicated by PAC Representative.
- .2 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by PAC Representative.

### **3.1 IDENTIFICATION ET PROTECTION (cont'd)**

- .3 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 PAC Representative.

PAC Representative must inspect Contractor's protective measures prior to beginning work. If necessary the PAC Representative will request to have branches over work zone trimmed by specialized personnel. Trimming must be supervised based on guidelines provided to the workers.

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 expense. The PAC Representative shall determine the cost without recourse.

A \$25 penalty will be applied to all minor injuries to trees and their components. The penalty will apply to minor damage to trunk, branches, branch collar and roots. Compensation will be based on tree's initial ornamental value less the current value considering the damage.

Trees with injuries over 50% of the total trunk circumference are considered a total loss and compensation will be based on the tree's basic value evaluated by a specialist representing the client.

The evaluation will be carried out by a PAC Representative with the required know-how in accordance with the SIAQ Guide d'évaluation des végétaux d'ornement

Clearing and burial operations must be carried out under supervision of PAC Representative.

Remove tree and shrub roots exposed or damaged by excavation or removal of existing structures by specialized personnel and as indicated by PAC Representative. Use clean cuts or tree surgery.

### **3.2 PROTECTIVE FENCING**

- .1 Apply the following measures during construction period to all Work lasting two days or more.
- .2 Use fence to identify tree protection zone. Mobile fencing is allowed inside work zone provided root systems are protected inside drip line.
- .3 Follow PAC Representative's indications for installing fencing 1.2 metres high and 3 metres minimum distance from trunk, wooded area, tree or trees and shrubs to be preserved, as indicated by PAC 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.

### **3.3 TRUNK PROTECTION**

- .1 Where fencing cannot be installed, trees identified by the supervisor with 1.8 metre planks around the trunks of trees identified by supervisor. Secure planks with plastic or steel straps cushioned with two strips of rubber such as tire rubber.

### **3.4 ROOT CURTAIN SYSTEM**

- .1 Identify limits for required construction excavation as approved by PAC Representative.
- .2 Prior to construction excavation, 500 mm wide x 1500 mm deep, along perimeter of excavation limits.
- .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
- .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 from damage during construction operations.

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

- .1 Centre line location and limits of trench/tunnel excavation to be approved by PAC Representative prior to excavation.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .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.

### **3.6 LOWERING GRADE AROUND EXISTING TREES**

- .1 Begin Work in accordance with schedule approved by PAC 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 When severing roots at excavation level, cut roots with sharp tools. Cleanly prune roots exposed and damaged by excavation and removal of existing structures, by specialized personnel and as indicated by PAC Representative.

### **3.6 LOWERING GRADE AROUND EXISTING TREES (cont'd)**

- .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% Standard Proctor Density.
- .7 Water entire root zone to optimum soil moisture level.
- .8 Install surface cover of sodding in accordance with Section 32 92 23 - Sodding.

### **3.7 PRUNING**

- .1 Remove branches interfering with machinery and likely to be damaged as indicated on site by PAC Representative.
- .2 Prune branches along trail to clear trail over 5 metres wide and 2.50 metres high. PAC Representative will indicate additional hindering branches to cut.
- .3 Remove branches prior to machinery work following thinning procedure defined under standard NQ 0630-100.
- .4 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through ecological disposal, composting and mulching.
- .5 Remove dead, weakened, sick or deteriorated branches from trees identified by PAC Representative. Prune, trim, thin and clean crown to promote healthy growth.
- .6 Remove live branches:
  - .1 Interfering with healthy vigorous tree growth, including branches interfering or rubbing against main branches.
  - .2 Indicating weakness, particularly forked branches.
  - .3 Interfering with growth of main branches.
  - .4 That are broken.
- .7 Cut living branches to re-establish natural shape of tree, particularly:
  - .1 One or more shoots.
  - .2 Multiple shoots caused by prior trimming.
  - .3 Branches that don't correspond to natural shape.
  - .4 Undesirable shoots.
- .8 Remove cut branches and twigs and other debris from tree.
- .9 Hanging vines.

### **3.7 PRUNING (cont'd)**

- .10 Branches under 50 mm in diameter:
  - .1 Locate branch bark ridge and make smooth cut outside branch collar at symmetrical angle to branch bark ridge and trunk.
  - .2 Remove dead branches using clean cuts adjacent to branch bark ridge without damaging it.
  - .3 Do not cut main branches unless requested by PAC Representative.
- .11 Branches over 50 mm in diameter:
  - .1 Under branch, 300 mm from trunk, first cut one third through branch.
  - .2 On top of branch, 500 mm from trunk, make a second cut through until branch falls away.
  - .3 Make last cut close to branch.
- .12 Do not damage bark or branch collar during pruning.
  - .1 Repair damaged parts and remove at nearest branch collar.
- .13 Remove extraneous shoots as indicated by PAC Representative.

### **3.8 TREATING INJURIES**

- .1 Trim bark away from injury in oblong shape to prevent spreading. Do not remove healthy bark inside trimmed area.

### **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.

### **3.10 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Clear pruning debris and recycle or compost if possible; remove daily from site.
- .3 Chip all vegetative matter removed during clearing and grubbing work.
- .4 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .5 Apply strict control to the disposal of elms, due to Dutch Elm disease. Remove all parts of elm trees that have been cut, including the trunk, to an authorized disposal facility and provide proof to PAC Representative.

**3.10 CLEANING (count'd)**

- .6 Because of the emerald ash borer, any tree identified as such is subject to stringent control measures regarding the disposal of ash trees. The Contractor must collect all felled wood including the stump and transport to an authorized site and provide proof to the PCA Representative for verification.
  - .1 Ash waste such as branches and logs with a diameter not exceeding 20 cm must be shredded immediately on site during pruning or felling. Chip size must not exceed 2.5 cm on at least two sides.
  - .2 Ash waste such as branches and logs with a diameter exceeding 20 cm:
    - .1 After felling and pruning, the Contractor must collect all the wood and transport it to an authorized facility for treatment.  
Or
    - .2 Sent to a wood processing plant or kept on site and transformed using a suitable process after felling and pruning.
  - .3 In other cases, the Contractor must provide proof of the uses and movements for verification by the PCA Representative.
  - .4 Fell ash trees between September 15 and April 15.

**END OF SECTION**

## **PART 1      GENERALITIES**

### **1.1            PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION**

- .1      Granular base materials.

### **1.2            RELATED SECTIONS**

- .1      Section 31 05 16 - Aggregate Materials;
- .2      Section 31 23 33.01 – Excavating, Trenching and Backfilling;
- .3      Section 32 11 23 – Aggregate Base Courses;
- .4      Despite the preceding list, it is the responsibility of the Contractor to obtain a copy of all sections of this specification even if they do not appear relevant to its specialty. The Contractor implicitly acknowledges that he accepts the clauses and instructions of all sections of the specifications, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections included in this specification.

### **1.3            REFERENCE STANDARDS**

- .1      American Society for Testing and Materials (ASTM) :
    - .1      ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing;
    - .2      ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
    - .3      ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;
    - .4      ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>);
    - .5      ASTM D1557-12, 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>);
    - .6      ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils;
    - .7      ASTM D4318-10e1, 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      Ministry of Transport of Quebec (MTQ):
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- .1 Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
  - .2 Standard 1101, Classification of Soils, version 2018-12-15;
  - .3 Standard 2101, Aggregates, version 2007-12-15.
  - .4 Quebec Bureau of Standardization (BNQ):
    - .1 BNQ 2560-114/2014, Civil Engineering Work – Aggregates;
    - .2 BNQ 2501-258/2012 – Soils - Determination of the water content/density relationship - Vibrator hammer test.
- 1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**
- .1 Submit required documents and samples in accordance with section 01 33 00 – Submittal Procedures.
- 1.5 DELIVER, STORAGE AND HANDLING**
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - General Product Requirements.
- 1.6 WASTE MANAGEMENT AND DISPOSAL**
- .1 Bring unused aggregates to a quarry or an off-site local treatment facility.
- PART 2 PRODUCTS**
- 2.1 MATERIALS**
- .1 Granular sub-base material: in accordance with Section 31 05 16 - Aggregate Materials.
  - .2 Crushed stone MG-20 shall be in accordance with Section 31 23 33.01 - Excavation, Trenching and Backfilling and those outline out below.
- PARTIE 3 EXECUTION**
- 3.1 EXAMINATION**
- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.
    - .1 Visually inspect substrate in the presence of the PCA Representative.
    - .2 Inform the PCA Representative of unacceptable conditions immediately upon discovery.
    - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of approval to proceed from the PCA Representative.
-

### **3.2 PLACING**

- .1 Place granular sub-base after subgrade is inspected and approved by the PCA Representative.
- .2 Construct granular sub-base to specified depths and grades.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.

### **3.3 COMPACTION**

- .1 Compact to density of not less than 98% corrected maximum dry density.
- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .3 Apply water as necessary during compaction to obtain specified density.
- .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the PCA Representative.
- .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .6 In areas of existing canal embankment, dynamic compaction may be performed only after receipt of written authorization from the PCA Representative.

### **3.4 TRANSITION**

- .1 The transition to be made for connection with the existing pavement structure shall be 1V: 2H in the foundation and granular base layers,

### **3.5 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.
-

**3.6 PROTECTION**

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by the PCA Representative.

**3.7 REJECTION OF A LOT**

- .1 A lot is rejected when the difference between the average of the three (3) particle size analysis results and the required values exceeds at least one of the critical differences (Ec) defined below:
  - .1 Ec (for the requirement of 112 mm seive): - 5%.
  - .2 Ec (for the requirement greater than the 80 µm sieve): + 1%.
  - .3 In this case, the Contractor shall remove and replace, at his expense, the granular materials included in the rejected lot.

**END OF SECTION**

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## **PART 1      GENERALITIES**

### **1.1      PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION**

- .1      Granular sub-base materials required for the completion of the base layer provided by the Contractor.

### **1.2      RELATED SECTIONS**

- .1      Section 31 05 16 - Aggregate Materials;
- .2      Section 31 23 33.01 – Excavating, Trenching and Backfilling;
- .3      Section 32 11 16.01 – Granular Sub-Base.
- .4      Despite the preceding list, it is the responsibility of the Contractor to obtain a copy of all sections of this specification even if they do not appear relevant to its specialty. The Contractor implicitly acknowledges that he accepts the clauses and instructions of all sections of the specifications, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections included in this specification.

### **1.3      REFERENCE STANDARDS**

- .1      American Society for Testing and Materials (ASTM) :
    - .1      ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
    - .2      ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
    - .3      ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
    - .4      ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
    - .5      ASTM D1557-12, 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>).
    - .6      ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
    - .7      ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
  - .2      Office des normes générales du Canada (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      Ministry of Transport of Quebec (MTQ):
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- .1 Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
  - .2 Standard 1101, Classification of Soils, version 2018-12-15;
  - .3 Standard 2101, Aggregates, version 2007-12-15.
  - .4 Quebec Bureau of Standardization (BNQ):
    - .1 BNQ 2560-114/2014, Civil Engineering Work – Aggregates;
    - .2 BNQ 2501-258/2012 – Soils - Determination of the water content/density relationship - Vibrator hammer test.
- 1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**
- .1 Submit required documents and samples in accordance with Section 01 33 00 – Submittal Procedures.
- 1.5 DELIVERY, STORAGE AND HANDLING**
- .1 Deliver aggregates and stockpile them in accordance with Section 31 05 16 – Aggregate Materials.
- 1.6 WASTE MANAGEMENT AND DISPOSAL**
- .1 Separate and recycle waste as directed by PCA Representative.
  - .2 Bring unused aggregates to a quarry or an off-site local treatment facility.
- PART 2 PRODUCTS**
- 2.1 MATERIALS**
- .1 Granular base materials shall be in accordance with Section 31 05 16 – Aggregate Materials.
  - .2 Granular base materials of calibre MG-56 et MG-112 shall be in accordance with Section 31 23 33.01 – Excavation, Trenching and Backfilling and those outlined below.
- PART 3 EXECUTION**
- 3.1 PLACEMENT AND INSTALLATION**
- .1 Place granular base after subgrade surface is inspected and approved by the PCA Representative.
  - .2 Construct granular base to specified depths and grades.
  - .3 It is permissible to reuse the materials in place for the lower foundation if allowed
  - .4 Ensure no frozen material is placed.
  - .5 Place material only on clean unfrozen surface, free from snow and ice.
-

- .6 Place material using methods which do not lead to segregation or degradation of aggregate.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 Remove and replace portion of layer in which material has become segregated during spreading.
- .11 Compaction Equipment:
  - .1 Ensure compaction equipment can obtain required material densities for the current work.

### **3.2 COMPACTION**

- .1 Compact MG-56 to density of not less than 98 % corrected maximum dry density
- .2 Compact MG-112 to density of not less than 95 % corrected maximum dry density
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .4 Apply water as necessary during compacting to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the PCA Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.3 TRANSITION**

- .1 The transition to be made for connection with the existing pavement structure shall be 1V: 2H in the granular sub-bases and aggregate base courses.

### **3.4 SITE TOLERANCES**

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

### **3.5 PROTECTION**

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by the PCA Representative.
-

### **3.6 REJECTION OF A LOT**

- .1 A lot is rejected when the difference between the average of the three (3) particle size analysis results and the required values exceeds at least one of the critical differences (Ec) defined below:
  - .1 Ec (for the requirement of 112 mm seive): - 5%.
  - .2 Ec (for the requirement greater than the 80  $\mu$ m sieve): + 1%.
  - .3 In this case, the Contractor shall remove and replace, at his expense, the granular materials included in the rejected lot.

**END OF SECTION**

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## **PART 1        GENERALITIES**

### **1.1            SECTION CONTENT**

- .1        Supply and installation of materials required for the construction of asphalt used for roads, multi-use trails and parking lots.

### **1.2            PRODUCTS TO BE PROVIDED ONLY UNDER THE PRESENT SECTION**

- .1        All materials related to this section to be provided by the Contractor.

### **1.3            RELATED SECTIONS**

- .1        Section 31 05 16 – Aggregate Materials;
- .2        Despite the preceding list, it is the responsibility of the Contractor to obtain a copy of all sections of this specification even if they do not appear relevant to its specialty. The Contractor implicitly acknowledges that he accepts the clauses and instructions of all sections of the specifications, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections included in this specification.

### **1.4            REFERENCE STANDARDS**

- .1        American Society for Testing and Materials International, (ASTM):
  - .1        ASTM D698-12, 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>)).
- .2        Ministry of Transport of Quebec (MTQ):
  - .1        Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
  - .2        Standard 4104, Fluid Asphalt, 2015-12-15.
  - .3        Standard 4105, Asphalt Emulsions, 2011-12-15.
  - .4        Standard 4201, Hot Mix Formulated in accordance with the Marshall Method, 2007-12-15.
  - .5        Standard 4202, , Hot Mix Formulated in accordance with the Methods developed by the Pavement Laboratory, 2018-12-15.

### **1.5            DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1        Product Data Sheets
    - .1        Submit product data sheets and other required documents at least 2 weeks before commencing the work.
    - .2        At least 2 weeks prior to commencing work, submit to the PCA Representative for verification, the formulation of the asphalt mix and the results of the tests on that mixture and the certificate issued by the manufacturer guaranteeing that the asphalt meets the requirements of this section.
-



- .2 Samples
  - .1 Inform the PCA Representative of the proposed source of aggregates and provide access for sampling at least 2 weeks prior to beginning Work.

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

- .1 Transport, store and handle materials and equipment in accordance with manufacturer's written instructions.
- .2 Deliver aggregates and stockpile on site. Before beginning the preparation of the bituminous mixture, stock at least 50% of the total quantity of aggregates required.
- .3 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.
- .4 Stockpile fine aggregate separately from coarse aggregate, although separate stockpiles for more than two mix components are permitted.
- .5 Provide approved storage, heating tanks and pumping facilities for asphalt cement.

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Remove all packaging materials from site and bring to appropriate recycling facilities.
- .2 Place substances that meet the definition of toxic or hazardous waste in designated containers.
- .3 Bring unused asphalt materials to an appropriate recycling facility.

## **1.8 PROTECTION MEASURES**

- .1 Do not allow any vehicles to travel on freshly installed pavement until surface temperature has dropped below 38 °C.
- .2 Do not allow loads on freshly installed pavement for a period of at least 24 hours after placement.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Aggregates: in accordance with Section 31 05 16 – Aggregate Materials and in accordance with the requirements of CCDG and BNQ 2560-114
    - .1 Crushed aggregates: MG-20, MG-56 and MG-112.
  - .2 Asphalt paving mix shall be in accordance with Standard 4201 and/or Standard 4202 du Ministry of Transport of Quebec (MTQ):
    - .1 Base course of Type ESG-14 (PG 58H-34) minimum compacted thickness of 70 mm.
-

- .2 Surface course of Type ESG-10 (PG 58H-34) minimum compacted thickness of 55 mm.
- .3 Surface course of Type EC-10 (PG-58S-28) minimum compacted thickness of 50 mm.
- .3 Use produces with Low Volatile Organic Compounds (VOC) ex. asphalt emulsion rather than fluidized asphalt.
- .4 Comply with Environment and Climate Change Canada's (ECCC) Code of Practice for the Reduction of Volatile Organic Compounds originating from fluidized asphalt and asphalt emulsion.

## **2.2 EQUIPMENT**

- .1 Spreader: Use a self-propelled mechanical spreader capable of spreading the mixture according to the alignment, slope and bulge indicated and within the prescribed tolerance.
- .2 Compactors: Use a sufficient number of compactors of the appropriate type and weight to obtain a compacted mixture at the specified density.
- .3 Field Testing Laboratory: provide space for site-specific laboratory testing, record keeping and reporting.

## **2.3 MIX DESIGN**

- .1 The hot mix asphalt formulation must be dated and signed by the manufacturer's Quality Control Authority and must be submitted at least one week prior to supplying the hot mix asphalt to the PCA Representative. It must be accompanied by the results of the qualitative tests of the aggregates used. A theoretical formula per type of asphalt mix must be produced for each type of binder or change in aggregate supply sources. The characteristics presented there must be representative of the hot mix that will be put in place and complies with the requirements of the applicable standard:
- .2 Mix design must be in accordance with Standard 4201- Hot Mix Formulated According to the Marshall method.
- .3 Mix design must be in accordance with Standard 4202- Hot Mix Formulated According to the Methods developed by MTQ's Pavement Laboratory.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt paving in accordance with manufacturer's written instructions.
    - .1 Visually inspect substrate in the presence of the PCA Representative.
    - .2 Inform the PCA Representative of unacceptable conditions immediately upon discover.
-

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt approval to proceed from the PCA Representative.

### **3.2 PREPARATION OF SURFACES**

- .1 Prior to commencing asphalt work, the Contractor shall ensure that the PCA Representative has approved and accepted the pavement foundation levels and has authorized the commencement of asphalt paving.
- .2 Before beginning the work, clean and clear surfaces to be coated from non-adherent or foreign substances, such as leaves or other residues from trees.
- .3 Preparation of the coating surface: according to the CCDG.
- .4 Application of the priming and bonding coats: according to the CCDG.
- .5 Application of the asphalt paving: according to the CCDG.
- .6 Install asphalt concrete mixes after foundation is dry, unfrozen, free of snow and ice, and air and surface temperatures are above 2 °C.
- .7 The temperature of the mixture must never be less than 120 °C nor greater than 160 °C.
- .8 Compact each layer with a steamroller as soon as it can support the weight without cracking or moving.
- .9 Continue rolling until traces of the roller disappear from the surface. Compact until a density of not less than 93% of the reference value (CCDG) is obtained.
- .10 Keep the roller at a speed that is sufficiently low to avoid shifting the mixture and not holding the roller on the freshly laid liner.
- .11 Moisten roller cylinders with water to prevent sticking of mixture.
- .12 Compact with other approved material in areas inaccessible to roller.
- .13 Carry a smooth surface with no irregularities greater than 10 mm and not greater than 10 mm when tested with a 4.5 m ruler in any direction.

### **3.3 JOINTS**

- .1 Prior to installing the asphalt layer, coat exposed vertical surfaces of joints, coat around the perimeter of manholes and catchbasins, and coat around any other similar structures with a bituminous binder.
  - .2 Before placing the surface layer, coat the base layer with a bituminous binder.
  - .3 Place bituminous material when hot and carefully compact on joint surfaces.
-

### **3.4 TRANSPORTATION OF MIX**

- .1 Transport mix to job site in vehicles cleaned of foreign materials. A tarpaulin is mandatory on transportation trucks.
- .2 Supply the spreading materials at a steady rate and in quantities compatible with the capacity of the spreading and compaction equipment.
- .3 Ensure materials are delivered continuously in covered vehicles, then spread and compacted immediately. During delivery and set-up, the temperature of the mixture must be within the limits determined in accordance with the applicable MTQ standards, but must never be less than 120 degrees Celsius or greater than 160 degrees Celsius.

### **3.5 MISE EN PLACE DU BÉTON BITUMINEUX**

- .1 Obtain the PCA Representative's approval of the foundation base prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines as indicated on the drawings.
- .3 Placing Conditions:
  - .1 Place asphalt mixtures only when air temperature is 2 degrees C minimum.
  - .2 When temperature of surface on which material is to be placed falls below [10] degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
  - .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
  - .4 Clean all debris present prior to paving operations.
  - .5 Place the second layer of asphalt while the temperature of the first layer is below 50 degrees Celsius.
- .4 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.
  - .1 Correct irregularities in alignment left by the paver by trimming directly behind machine.
  - .2 Remove excess material forming high spots using shovel or lute.
  - .3 Fill and smooth indented areas with hot mix.
  - .4 It is forbidden to spread material over the surfaces to be repaired.
  - .5 Do not spread surplus material on surfaces that have just been leveled
- .5 Impregnation Binding Agent:
  - .1 Place binding agent on a dry granular surface and asphalt base at a rate 0,8 à 1,6 L/m<sup>2</sup>.

### **3.6 COMPACTAGE**

- .1 Roll asphalt continuously using the established rolling pattern for the test strip to density not less than 93% to 98 % of the reference value (MTQ) is obtained
-

- .2 General:
  - .1 Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.
  - .2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
  - .3 Operate roller slowly initially to avoid displacement of material.
  - .4 Overlap successive passes of roller by minimum of [200] mm and vary pass lengths.
  - .5 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
  - .6 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
  - .7 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
  - .8 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.
  - .9 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

### 3.7 JOINTS

- .1 General:
    - .1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
    - .2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
  - .2 Transverse Joints:
    - .1 Offset transverse joint in succeeding lifts by at least 1000 mm.
    - .2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
    - .3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.
  - .3 Longitudinal Joints:
    - .1 Offset longitudinal joints in succeeding lifts by at least 300 mm.
    - .2 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
    - .3 Roll longitudinal joints directly behind paving operation
-

.4 Construct feather joints in areas indicated, so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint to ensure joint is smooth and without visible breaks in grade.

.5 Construct butt joints as indicated.

### **3.8 FINISH TOLERANCES**

.1 Finished asphalt surface to be within 10 mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 10 mm when checked with 4.5 m straight edge placed in any direction.

### **3.9 DEFECTIVE WORK**

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.

.2 Repair areas showing checking, rippling, or segregation.

.3 Adjust roller operation and spreader settings on paver to prevent further defects such as rippling and checking of pavement.

### **3.10 CONNECTION TO EXISTING PAVEMENT**

.1 At the limit of the work, the Contractor shall mill and saw the existing pavement as indicated on the plans.

.2 The depth of milling must correspond to the thickness of the projected surface layer.

.3 The Contractor must dispose of milling waste outside the site.

.4 The saw cuts in the asphalt shall be linear and over the full thickness of the asphalt layer.

.5 Where cut and repair are required (in front of an existing concrete curb), the Contractor must respect the details presented on the plans.

### **3.11 REWORK**

.1 Any pavement considered by the PCA Representative as unsuccessful (joints, mixes, installation, profiles, etc.) must be redone by the Contractor to the satisfaction of the PCA Representative, and without any additional charges.

### **3.12 TRAFFIC CIRCULATION**

.1 The circulation of vehicles must be controlled by the Contractor so that circulation of vehicles is not permitted the fresh pavement until the surface has hardened.

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- .2 Establish adequate signage at the extremities as well as within the work area to ensure the required control.

**3.13 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .4 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.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling
- .3 Section 32 11 23 – Aggregate Base Courses

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM C136-[13], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .2 ASTM C979/C979M-[10], Standard Specification for Pigments for Integrally Colored Concrete.
- .2 CSA Group
  - .1 CSA A23.1/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA A231.1/A231.2-06 (R2010), Precast Concrete Paving Slabs/Precast Concrete Pavers.
  - .3 CSA A283-F06 (C2011), Qualification Code for Concrete Testing Laboratories.
- .3 Canadian Standards Association (CSA)
  - .1 CSA A23.1-F04 Concrete Materials and Methods of Concrete Construction.
  - .2 CSA A23.2-F04 Test Methods and Standard Practices of Concrete.
  - .3 CSA A23.4-F00 Precast Concrete: Materials and Construction.
  - .4 CSA A179-F04 Mortar and Grout for Unit Masonry.
  - .5 CSA A251-F00 C2005 Qualification Code for Architectural and Structural Precast Concrete Products.
  - .6 CSA A231.2 Precast Concrete Pavers.
- .4 Bureau de normalisation du Québec [NQ]
  - .1 NQ 1809-840 Pavés préfabriqués en béton de ciment - Pose -Clauses techniques générales (Precast Cement Concrete Pavers).
  - .2 NQ 2624-120 Pavés de béton de ciment préfabriqués. (Precast Concrete Pavers)
  - .3 NQ 2624-900 Protocole particulier de certification - Pavés préfabriqués de béton de ciment (Precast Cement Concrete Pavers).



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

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for precast concrete unit paving and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Subject product data to PCA Representative for samples, tests, origin, granulation, mineral content and characteristics of following materials:
    - .1 Concrete pavers (each type).
    - .2 Bedding material.
    - .3 Polymeric sand joint filler.
- .3 Samples
  - .1 Submit full size sample of each type standard paver.
  - .2 Submit one (1) sample for approval:
    - .1 Joint material.
    - .2 Sand (bedding) in sufficient quantity for laboratory tests.
  - .3 Mock-up will be used:
    - .1 To judge quality of work, substrate preparation, operation of equipment and material application.
    - .2 To determine surcharge of bedding layer, joint sizes, lines, laying patterns, colours and texture.
    - .3 For testing to determine compliance with performance requirements. Perform the following tests.
    - .4 Locate where indicated.
    - .5 Allow 24 hours for inspection of mock-up before proceeding with work.
    - .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- .4 Test and Evaluation Reports:
  - .1 Submit following sampling and testing data:
    - .1 Sieve analysis for gradation of bedding and joint material.
    - .2 Unit paver sampling and testing.
  - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  - .3 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

## 1.4 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Installer: company or person specializing in precast concrete paver installations, with five years' experience.

## 1.5 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect precast concrete units from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## PART 2 PRODUCTS

### 2.1 CONCRETE PAVERS

- .1 General:
  - .1 Variations in homogenous pattern are subject to approval by PCA Representative.
  - .2 Compressive strength: 50MPa.
  - .3 Water absorption: 5% maximum.
  - .4 Maximum mass loss in saline solution (NaCl 3%): 225 g/m<sup>2</sup> after 28 cycles and 500 g/m<sup>2</sup> after 49 cycles.
- .2 Factory-made pavers corresponding to the following:
  - .1 Concrete pavers, **Avenue type by Bolduc**, no substitution.
    - .1 Type 1: Light grey unit: 100 x 300 x 300 mm.
    - .2 Type 2: Dark grey unit: 100 x150 x 300 mm.
  - .2 Finish: Grenart.
- .3 Manufactured in moulds, with spacers, suitable for installation and delivered on site in cubes of laying panels, in protective wrapping.
- .4 Pigment in concrete pavers: to ASTM C979/C979M.

### 2.2 PREFABRICATED CONCRETE PAVERS

- .1 Factory-made steps corresponding to the following:
  - .1 Factory-made concrete steps, Prestige by Permacon, no substitution.
    - .1 Light grey unit: 180 x 400 x 1,200 mm

**2.3 BEDDING AND JOINT MATERIAL**

- .1 Determine bedding material hardness as follows:
  - .1 Randomly select single 1.4 kg sample from material source.
  - .2 Dry sample for 24 hours at 115 degrees C to 121 degrees C.

**2.2 BEDDING AND JOINT MATERIAL (cont'd)**

- .3 Obtain 3 sub-samples each weighing 0.2 kg by passing original sample several times through riffle box.
- .4 Carry out sieve analysis test on each sub-sample in accordance with CSA A23.1/A23.2.
- .2 Remix each sub-sample and place in nominal litre capacity porcelain jar with two 2 mm diameter steel ball bearings weighing 75 +/-5 g each. Rotate each jar at 50 rpm for six 6 hours. Repeat sieve analysis. Record individual and average sieve analysis.
- .3 For each sample tested, maximum increase in percentages passing each sieve and maximum individual percent passing is in accordance with table as follows:

Sieve Size	Maximum Increase	Maximum Passing
0.075 mm	2%	2%
0.150 mm	5%	15%
0.300 mm	5%	35%

- .4 Bedding and joint material: clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock or gravel. Do not use limestone screenings or stone dust.
- .5 Gradation: to CSA A23.1/A23.2, Table 4 - Grading Limits for Fine Aggregate, and CAN/CSA-A179 as follows.

Sieve (mm)	% Passing for Bedding Sand	Joint Sand
10 mm	100	
5 mm	95 -100	100
2.5 mm	80 - 100	95 - 100
1.25 mm	50 - 90	60 - 100
630 microns	25 - 65	
600 microns	35 - 80	
315 microns	10 - 35	
300 microns	15 - 20	
160 microns	2 - 10	
150 microns	2 - 15	

- .6 Polymeric jointing sand, commercial grade, high performance (RG+), colours matched to paver types, as selected by PCA Representative.

## **2.4 EDGE RESTRAINTS**

- .1 PVC or medium density polyethylene, industrial and flexible type edging, manufactured for use in paver installation, complete with connectors and pre-manufactured anchoring locations for spikes. Edging to include connectors spiral spikes at 254 mm x 9.5 mm and spikes necessary for anchoring.

## **2.5 CLEANING COMPOUND**

- .1 Clear, organic solvent, designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.
- .2 Acid based chemical detergent, designed and recommended by manufacturer for removal of contamination encountered on pavers.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for precast concrete unit paving installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of PCA Representative.
  - .2 Inform PCA Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after approval from PCA Representative.

### **3.2 STRUCTURAL SURFACE**

- .1 Verify that structural surfaces conform to levels and compaction required for installation of unit pavers. If discrepancies occur, notify PCA Representative and do not commence work until instructed by PCA Representative.
- .2 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3 m straightedge.
- .3 Ensure that structural surface is not frozen or standing water is present during installation.

### **3.3 INSTALLATION OF EDGE RESTRAINTS**

- .1 Install restraints true to grade, in accordance with manufacturer's recommendations.

### **3.4 PLACING OF BEDDING MATERIAL**

- .1 Ensure bedding material is not saturated or frozen at all times until installation is complete.
- .2 Spread and screed material on structural surface to achieve 25 mm compacted thickness after vibrating pavers in place. Do not use joint sand for bedding sand.
- .3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

### 3.5 INSTALLATION OF CONCRETE PAVERS

- .1 Lay pavers to patterns indicated. Joint spacing as recommended by manufacturer approximately 3 mm wide.
- .2 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures.
- .3 Place pavers and edge stones according to to plan patterns. Place pavers manually or mechanically, following slopes, levels, sizes, layout and sequence illustrated on plan.
- .4 Installation by mechanical equipment: mechanically and manually installed.
  - .1 Prepare installation sequence and obtain approval of sequence by PCA Representative.
  - .2 Place paver pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.
  - .3 Run equipment approved for installation only on paving surfaces vibrated in place.
  - .4 Inspect pavers and remove chipped, broken or otherwise damaged pavers if structural performance or aesthetics is adversely compromised as directed by PCA Representative.
  - .5 Replace pavers removed without altering layout and structural quality.
- .5 Cut pavers and edging using masonry saw in circles or angles, if necessary to adjust to existing elements (furniture, lamppost, bollard, manholes, storm sewers and others). Unless otherwise indicated on plan or instructions from PCA Representative on site, use only full pieces along edges, beginning and end of cladding, sides and corners. Select pavers according to drawing details and as indicated by supervisor on site to meet project requirements.
- .6 Do not cut concrete pavers more than half their total size. Contractor must adjust ahead to avoid finishing with pavers less than half their size.
- .7 Where pavers are adjacent to bituminous concrete, overlap paver pattern 1 to 3 metres before cutting bituminous concrete, setting joint widths as specified in this Section to determine the actual width to cut.
- .8 Do not circulate with machinery, vehicles and equipment on concrete paver surfaces prior to compaction and filling joints. Place paver palettes and other materials to not exceed load capacity of covered surface or otherwise damage surface in any way.
- .9 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.
- .10 Inspect, remove, and replace chipped, broken and damaged pavers.
- .11 Sweep dry joint sand material into joints.
- .12 Settle sand by vibrating pavers with plate compactor.
- .13 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.

**3.5 INSTALLATION OF CONCRETE PAVERS (cont'd)**

- .14 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.
- .15 Sweep off excess joint material when installation is complete.
- .16 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.
- .17 Final surface elevations not to exceed plus or minus 10 mm under 3 m long straightedge.
- .18 Surface elevation of pavers: 3 to 4 mm above adjacent drainage inlets, concrete collars or channels.
- .19 Ensure conformance of final elevations.

**3.6 PRECAST CONCRETE UNIT CLEANING**

- .1 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.
- .2 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.
- .3 Final surface to be free of contamination.

**3.7 FIELD QUALITY CONTROL**

- .1 If deemed necessary, client may retain concrete testing laboratory accredited in accordance with CSA A283.
- .2 Sample and test in accordance CSA A23.1/A23.2.
- .3 Do sampling and testing once for each 5,000 square metres of material on site, as directed by PCA Representative.
- .4 PCA Representative will select 10 pavers for testing from material on site for each sampling.
- .5 Submit test results to PCA Representative for approval of precast concrete pavers.

**3.8 CLEANING**

- .1 Leave Work area clean at end of each day.  
Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .2 Remove of loose, extraneous materials from surfaces to be cleaned.
- .3 Final surface to be free of dirt or tire marks.

**3.9 MAINTENANCE**

- .1 Regularly inspect Work. As needed, fill joints between pavers according to steps described above, until final acceptance of Work.

**END OF SECTION**



## **PART 1      GENERALITIES**

### **1.1            RELATED SECTIONS**

- .1      Section 03 30 00 – Cast-In-Place Concrete;
- .2      Section 31 00 00.01 – Earthworks;
- .3      Section 31 05 16 – Aggregate Materials;
- .4      Section 31 23 33.01 – Excavating, Trenching and Backfilling;
- .5      Despite the preceding list, it is the responsibility of the Contractor to obtain a copy of all sections of this specification even if they do not appear relevant to its specialty. The Contractor implicitly acknowledges that he accepts the clauses and instructions of all sections of the specifications, even if he fails to consult certain sections. Refer to the table of contents for the complete list of sections included in this specification.

### **1.2            REFERENCE STANDARDS**

- .1      American Society for Testing and Materials International (ASTM) :
    - .1      ASTM C117-13, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
    - .2      ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
    - .3      ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
    - .4      ASTM D698-12, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .2      Canadian Standards Association (CSA)/CSA International:
    - .1      CSA-A23.1/A23.2-F09, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete;
    - .2      CSA A3000-2013, Cementitious Materials Compendium (Contains A3001, A3002, A3003, A3004 et A3005);
    - .3      CAN/CSA-G30.18-FM92 (C2004), Carbon Steel Bars for Concrete Reinforcement;
    - .4      CAN/CSA-A23.3-2014 – Design of Concrete Structures;
    - .5      CSA G30.18-2009 (R2014), Carbon Steel Bars for Concrete Reinforcement;
    - .6      CSA G40.20-2013/G40.21-2013, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel;
    - .7      CAN/CSA-G164-2018, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3      Reinforcing Steel Institute of Canada (RSIC)
    - .1      IAAC-2006, Reinforcing Steel, Manual of Recommended Standards.
  - .4      Ministry of Transport of Quebec (MTQ):
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- .1 Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
- .2 Standard 3101, Normal Density Concrete, 2018-12-15.
- .5 Bureau de normalisation du Québec (BNQ):
  - .1 CAN/BNQ 2501-255, Soils - Determination of water content-density relationship - Test with modified compaction energy (2 700 kN m/m<sup>3</sup>).
  - .2 BNQ 2560-114/2014, Civil Engineering Work – Aggregates.
  - .3 BNQ 2621-905/2012 – Ready-to-Use Concrete - Certification Program (developed from the requirements of Chapter 4, 5 and 8 of CSA A23.1-F09 / A23.2-F09)

### **1.3 DOCUMENTS/SAMPLES TO BE SUBMITTED**

- .1 At least two (2) weeks prior to start of work, submit to PCA Representative, for verification, concrete mix dosage formula and test results for this mixture.
- .2 Submit test results and reports to the PCA Representative for review and, in the event of any discrepancy or discrepancy with the dosing formula or parameters specified for the concrete mix, do not proceed without first obtaining a written authorization.

### **1.4 QUALITY ASSURANCE**

- .1 Submit to the PCA Representative, at least two (2) weeks prior to the start of concrete work, a valid and recognized certificate issued by the plant supplying the concrete.
- .2 Submit in writing to the PCA Representative the proposed source of supply for the reinforcing materials to be supplied.

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

- .1 Delivery and Acceptance
    - .1 Deliver materials to site in their original packaging, which must be labeled with the name and address of the manufacturer.
    - .2 Transportation Time: Concrete must be delivered to site and unloaded within a maximum of 120 minutes after mixing.
      - .1 Where applicable, any change in maximum transit time must be accepted in writing by the PCA Representative and Concrete Producer as per CSA A23.1 / A23.2.
      - .2 Deviations must be submitted to the PCA Representative for review.
  - .2 Storage and Handling
    - .1 Store materials and equipment so that they do not rest on the ground, in a clean, dry, well ventilated area as recommended by the manufacturer.
    - .2 Replace damaged reinforcing steel by new reinforcing steel.
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## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Granular base: material in accordance with Section 31 05 16 – Aggregate Materials and Section – Excavating, Trenching and Backfilling and in accordance with the following requirements.
  - .1 Type: Granular Base MG-20.
  - .2 Particle Size Distribution: the particle size of the materials used shall, when tested in accordance with ASTM C136 and ASTM C117, be within the specified limits; and the sieve size must be in accordance with CAN / CGSB-8.1.
- .2 Backfill Materials: material in accordance with Section 31 05 16 – Aggregate Materials and Section – Excavating, Trenching and Backfilling.
- .3 Formwork Materials: in accordance with CSA-A23.1/A23.2.
- .4 Reinforcing Steel Materials
  - .1 Galvanized Metallic Trellis of dimensions 152 mm x 152 mm and MW18.7 x MW18.7. The trellis sections should overlap 150 mm.
- .5 Concrete Materials
  - .1 Portland Cement: for general use, in accordance with CSA A3001 type GU unless otherwise indicated.
  - .2 Supplementary cementing materials: in accordance with CSA A3001.
  - .3 Water: to CSA A23.1/A23.2.
  - .4 Aggregates: to CSA-A23.1/A23.2.
  - .5 Other concrete constituents: to CSA A23.1/A23.2.

### **2.2 CONCRETE MIX**

- .1 Concrete to be prepared in accordance with CSA A23.1 / A23.2 to obtain a mix with the following qualities:
  - .2 The concrete mix used for all concrete elements must meet the following requirements:
    - .1 Portland Cement of Type GUb-SF;
    - .2 Compressive strength at 28 days: 35 MPa minimum.
    - .3 Class of exposure (Tabel 1, CSA A23.1): F-1
    - .4 Nominal size of course aggregate: 20 mm.
    - .5 Water/Cement ratio: maximum 0,50.
    - .6 Air content: 5 à 8 %.
    - .7 Slump: at time and point of 80 ± 30 mm.
    - .8 Pigmentation: see architectural plans for color specification, if necessary.
-

### **PART 3 EXECUTION**

#### **3.1 GRADE PREPARATION**

- .1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Construct embankments using excavated material free from organic matter or other objectionable materials.
  - .1 Dispose of surplus and unsuitable excavated material in approved location off site.
- .3 Place fill in maximum 150 mm layers and compact to at least 98% of maximum dry density to ASTM D698 or as indicated on drawings.

#### **3.2 GRANULAR BASE**

- .1 Obtain PCA Representative's approval of subgrade before placing granular base.
- .2 Place granular base material (MG-20) respecting lines, widths, and depths as indicated.
- .3 Compact granular base in maximum 150 mm layers to at least 95% of maximum density to ASTM D698.

#### **3.3 CONCRETE WORKS**

- .1 Obtain PCA Representative approval of granular base and reinforcing steel prior to placing concrete.
  - .2 Before pouring concrete, have granular base approved by laboratory and PCA Representative.
  - .3 Provide ready-mix concrete, manufactured in a concrete plant, transported and delivered to site in accordance with CSA-A23.1 / A23.2-F09.
  - .4 The manufacturer of the ready-mix concrete is responsible for the dosage of the concrete and must himself and at his expense take all necessary measures to ensure the quality and consistency of its product.
  - .5 Give the CPA Representative 48 hours notice before the start of each concreting sequence.
  - .6 Require that the concrete supplier is to provide a delivery slip for each concrete load and provide a copy of this slip to the PCA Representative. The following information should appear on the form: Supplier's name and address, truck number, Contractor's name, project designation and location, concrete class, concrete quantity and cumulative quantity, concrete loading time, the time unloaded started and the time un loading ended, maximum size of the aggregate, slump and air content required, types of admixtures used, quantity and type of cement and amount of water.
  - .7 Addition of water to the mixture after initial mixing at the plant is prohibited. Use an ASTM C 494 type F or G water-reducing additive to correct slump if necessary.
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- .8 Fabricate and install formwork in accordance with CAN / CSA-S269.3, to obtain finished concrete structures in the form, size and elevations as indicated and in the locations as indicated; and at all times adhering to the tolerances specified in CSA-A23.1 / A23.2.
  - .9 Place reinforcing steel in accordance with CSA-A23.1/A23.2 and in accordance with the following recommendations:
    - .1 Reinforcing steel must not be bent or welded on site.
    - .2 Ensure that the reinforcing steel and the imbedded portion is not moved.
    - .3 The mesh must be installed before concrete is placed and must be installed 100 mm from the surface. Stirrups, typically used in sidewalks, spaced at 600 mm can be used. The method of placing the mesh on the granular foundation in advance and then adjusting during casting is prohibited.
  - .10 Respect the following instructions during concrete works:
    - .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.
  - .11 Protect existing structures against dirt.
  - .12 Clean and remove stains prior to application for concrete finishes.
  - .13 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
    - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout to anchor and hold dowels in positions as indicated.
  - .14 Do not place load upon new concrete until authorized by the PCA Representative.
  - .15 Pour concrete in accordance with CSA A23.1 / A23.2.
  - .16 Sleeves and inserts :
    - .1 During casting of concrete, set sleeves, ties, anchors, reinforcements, conduits, pipe hangers, bolts, gaskets, joints and other items to be incorporated into the work.
    - .2 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by PCA Representative.
  - .17 Immediately after troweling, give the sidewalk surface a uniform brushed finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
  - .18 Provide edging as indicated with edging tool to provide radius as indicated on the plans.
  - .19 Sliding formwork machines equipped with a guide wire system as a level and alignment mark may be used if it is established that they will ensure the quality of implementation satisfactory to the PCA Representative. Finish surfaces with hand tools at the request of the PCA Representative
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### **3.4 SURFACE FINISH**

- .1 Finish surfaces in accordance with CSA A23.1/A23.2.
- .2 In accordance with the landscape architects' specifications.

### **3.5 EXPANSION AND CONTRACTION JOINTS**

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals as indicated on the drawings.
- .2 Install expansion joints as indicated on the drawings.
- .3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

### **3.6 JOINTS DE RUPTURE**

- .1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Seal isolation joints with sealant approved by PCA Representative.

### **3.7 CURING**

- .1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by PCA Representative.
- .2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

### **3.8 HOT WEATHER CONCRETE**

- .1 Hot weather concreting work must be performed in accordance with the requirements of CSA A23.1 (section 7.1.1) and ACI 305R. Submit to the PCA Representative for approval, the hot weather concreting procedures prior to the execution of the work.
  - .2 The Contractor shall provide concrete protection measures already in place against the effects of heat and dry weather. During very hot periods, it must protect the formwork, steel reinforcement and concrete equipment against direct sunlight and/or cool them by watering.
  - .3 Where the ambient temperature is 25 °C or higher or when the PCA Representative determines that it is likely to reach 25 °C during implementation, special precautions
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should be taken to keep the temperature of the concrete as low as possible, and never allowed to exceed 30 °C.

### 3.9 COLD WEATHER CONCRETE

- .1 Cold weather concreting work must be performed in accordance with the requirements of CSA A23.1 (section 7.1.2) and ACI 305R. Submit to the PCA Representative for approval, the cold weather concreting procedures prior to the execution of the work.
  - .2 Prior to the start of concrete placement in cold weather, all equipment necessary for concrete protection shall be available on site.
  - .3 No concrete pouring will be undertaken without the authorization of the PCA Representative when the outside temperature is below 5 °C.
  - .4 When the outside temperature is maintained at or below 5 °C or when, in the opinion of the PCA Representative, it is likely to fall below 5 °C during concrete casting, the temperature of the mixture must not be less than 16 °C nor more than 32 °. The water and, if necessary, the aggregates must then be heated before being incorporated into the mixture
  - .5 When concrete work is not carried out under a heated shelter, the PCA Representative may suspend any concrete work if the temperature is below 10 °C or if wind or snow conditions deteriorate.
  - .6 Before placing the concrete, the walls, steel reinforcement and bottoms of the formwork must be cleaned of any snow that may have accumulated and any ice that may adhere to it. Formwork and steel reinforcement should be heated for this purpose, if necessary. It is forbidden to place the concrete on or against a surface or to coat the steel reinforcement whose temperatures are below 5 °C.
  - .7 Efficient measures must be taken following concrete pouring to maintain concrete surface temperature at at least 21 °C for three (3) days or at at least 10 °C for seven (7) days. The concrete temperature must also be maintained above the freezing point for a period of seven (7) days and the concrete must be protected against freeze-thaw cycles for at least fourteen (14) days.
  - .8 The use of salt or other chemicals as a substitute for the concrete cure and protection methods listed above is prohibited.
  - .9 At the end of the prescribed protection periods, the concrete temperature should be gradually lowered to a maximum of 6 °C per day until the outdoor temperature is reached.
  - .10 If a shelter is built around the freshly poured concrete to facilitate heating, the Contractor shall, if necessary, humidify the ambient air so as to maintain the concrete and the forms continuously wet. If combustion heaters are used, they must be constructed and placed in such a way that the combustion gases do not come into contact with the fresh concrete surfaces.
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### **3.10 TOLERANCES**

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

### **3.11 FIELD QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be carried out by designated testing laboratory in accordance with CSA A23.1/A23.2].

### **3.12 BACKFILLING**

- .1 Allow concrete to cure for seven (7) days before backfilling.
- .2 Backfill to indicated levels with materials indicated on plans.
  - .1 Compact and profile as indicated on drawings.

### **3.13 CLEANING**

- .1 Perform cleaning work.
- .2 Upon completion of concrete installation and quality performance review, remove surplus materials, rubbish, tools and equipment from site.

### **3.14 DEFECTIVE CONCRETE**

- .1 Concrete with non-conforming results and defects affecting the capacity of the structure (such as concrete with insufficient strength and concrete with honeycomb or imperfections) must be demolished. and replaced by the Contractor at his expense.

**END OF SECTION**

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**PART 1        GENERALITIES**

**1.1            EXIGENCES CONNEXES**

- .1        Section 01 33 00 - Submittal Procedures;
- .2        Section 01 35 29.06 - Health and Safety;
- .3        Section 01 35 43 – Environmental Protection;
- .4        Section 01 61 00 – General Product Requirements
- .5        Section 01 74 00 - Cleaning;
- .6        Section 01 74 21 – Construction/Demolition Waste Management and Disposal;
- .7        Section 01 78 00 – Closeout Submittals;
- .8        Section 31 24 13 – Roadway Embankments;
- .9        Section 32 12 16.01 – Asphalt Paving;
- .10      Section 32 01 11.01 – Pavement Cleaning and Marking Removal.

**1.2            REFERENCES**

- .1        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-1.5-99, Low Flash Petroleum Spirits Thinner.
  - .2        CAN/CGSB 1.74-01, Paint, Traffic, Alkyd.
- .2        Health Canada - Workplace Hazardous Material Information System (WHMIS)
  - .1        Specification Sheets.
- .3        Green Seal Environmental Standards (GS)
  - .1        GS-11- 2008, 2nd Edition, Paints and Coatings.

**1.3            DOCUMENTS / SAMPLES TO BE SUBMITTED FOR APPROVAL / INFORMATION**

- .1        Submit required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2        Specification Sheets
    - .1        Submit specifications sheets required as well as manufacturer documentation regarding pavement makings. Specifications sheets must indicate product characteristics, performance criteria, dimensions, constraints and finish.
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- .2 Submit two (2) copies of the required Material Safety Data Sheets in accordance with WHMIS, and section 01 35 29.06 – Health and Safety Requirements section 01 35 43 – Environmental Protection.

- .3 Samples

- .1 At least four (4) weeks prior to commencing work, submit to the PCA Representative the following material sample quantities:
  - .1 Two (1) L samples of each type of paint.
  - .2 One (1) kg sample of glass beads.
  - .3 Sampling: in accordance with the MPI Painting Manual.
- .2 Identify each sample by indicating the name of the project and its location, paint manufacturer's name and address, type of paint, MPI Painting Manual specification number, the formulation number and the batch number.

#### 1.4 CLOSEOUT SUBMITTALS

- .1 Submit required documents in accordance with section 01 78 00 - Closeout Submittals.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – General Product Requirements and in accordance with manufacturer’s written instructions.
- .2 Delivery and acceptance: deliver materials to the work site in their original packaging and must contain a label with the name and address of the manufacturer.
- .3 Storage and Handling :
  - .1 Store materials so that they do not rest on the ground, and are in a clean, dry, well-ventilated area as recommended by the manufacturer.
  - .2 Replace damaged or substandard materials with new materials or materials of appropriate quality.
- .4 Packaging Waste Management: recuperate packaging waste for reuse or recycling according to section 01 74 19 – Construction/Demolition Waste Management and Disposal.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- .1 Paint
  - .1 Product: MPI-EXT 2.1B, alkyd traffic paint.
  - .2 Paints: according to the recommendations of MPI for surface condition.
    - .1 maximum 100 g/L COV according to the GS-11 standard
  - .3 Colour: yellow and white, approved by MPI

- .4 Upon request, the PCA Representative will supply a qualified product list of paints applicable to work. Qualified paints may be used but PCA Representative reserves the right to perform further tests.
- .2 Thinner : to be provided by the manufacturer and recognized by MPI.
- .3 Reflective Glass Microbeads : suitable for application on a freshly painted surface, to ensure retro reflection of road markings.

### **PART 3 EXECUTION**

#### **3.1 INSPECTION**

- .1 Verification of existing conditions: before proceeding with pavement marking, ensure that the condition of surface is acceptable and allow the work to be carried out in accordance with MPI instructions
  - .1 Visually inspect surfaces / supports in presence of PCA Representative.
- .2 Pavement surface: dry, free of water, frost, ice, dust, oil, grease and any other harmful material.
- .3 Begin marking work only after correcting unacceptable conditions.

#### **3.2 EQUIPMENT REQUIREMENTS**

- .1 Paint applicator to be an approved pressure type mobile distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified, and to dimensions as indicated, and to have positive shut off.
- .2 Distributor to be capable of applying reflective glass microbeads as an overlay on freshly applied paint.

#### **3.3 MAINTAINING TRAFFIC**

- .1 Maintain traffic in accordance with Section 01 14 00 – Restrictions on the Work.

#### **3.4 APPLICATION**

- .1 Pavement markings to be laid out by PCA Representative.
  - .2 Unless otherwise approved by PCA Representative, apply paint only when air temperature is above 10oC, wind speed is less than 60km/h and no rain is forecast within next 4h.
  - .3 Apply traffic paint evenly at rate of 48L/km of painted line.
  - .4 Do not thin paint unless approved by PCA Representative.
  - .5 Symbols and letters to conform to dimensions indicated.
-

- .6 Paint lines to be of uniform colour and density with sharp edges.
- .7 Thoroughly clean distributor tank before refilling with paint of different colour.
- .8 Apply glass microbeads at rate of 0.6 kg/L of painted area immediately after application of paint.

### **3.5 TOLERANCE**

- .1 Paint markings to be within plus or minus  $\pm 5$ mm of dimensions indicated.
- .2 Remove incorrect markings in accordance with Section 32 01 11.01 – Pavement Cleaning and Marking Removal

### **3.6 CLEANING**

- .1 Cleaning during work: Carry out cleaning in accordance with Section 01 74 11-Cleaning.
  - .1 Leave the work area clean and tidy at the end of each work day.
- .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment from the site in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: sort the waste for disposal, reuse or recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
  - .1 Remove garbage and recycling bins from the work site and dispose of the materials at appropriate facilities.

### **3.7 PROTECTION OF MARKINGS**

- .1 Protect pavement markings until dry.
- .2 Repair adjacent surfaces damaged by pavement markings

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00.01 - Cast-in-Place Concrete

**1.2 REFERENCES**

- .1 CSA International
  - .1 CAN/CSA-Z809-F08, Aménagement forestier durable.
- .2 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .3 Sustainable Forestry Initiative (SFI)
  - .1 Norme SFI-2010-2014.

**1.3 QUALITY ASSURANCE**

- .1 Only companies specialized in the manufacture of metalwork and exterior site furnishings will be accepted for work under this section.
- .2 The PCA Representative may require the inspection of any part of the work that appear to not comply with the contract documents. The Contractor must take measures to make work compliant if deemed not compliant with contract documents and assume inspection costs and repairs. If work is deemed compliant, the Maître de l'ouvrage will pay the costs for inspection and restoration.

**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 furniture and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit shop drawings indicating dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.
- .4 Materials:
  - .1 Submit two 300 mm long samples of wood selected to fabricate bench boards. Coat sample with indicated finish product.

**1.5 CLOSEOUT SUBMITTALS**

- .1 Submit maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory PCKaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect furnishings from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **1.7 WARRANTY**

- .1 Obtain written 3-year warranty from furniture and equipment manufacturers effective upon provisional acceptance of the Work.
- .2 Paint:
  - .1 5-year warranty: excessive discolouration of polyester powder paint due to UV radiation.
  - .2 3-year warranty: peeling.
- .3 Warranty covers proper operation and appearance of equipment (parts and labour) and replacement of defective parts covered in this Section.
- .4 Contractor must comply with manufacturer's standards and particularly equipment components.

## **PART 2 PRODUCTS**

### **2.1 GENERAL**

- .1 Steel shapes, plates and bars: to CSA G40.21-1976 grade 38W, round and flat.
- .2 Screws and bolts: to ASTM A-325M, sized for work and as indicated on drawings.
  - .1 Anti-vandalism anchors that may be removed and reinstalled with special tool designed for assembly. Provide PCA Representative with two special tools.
- .3 Accessories:
  - .1 Other accessories: as indicated on drawings and as needed.
- .4 Welding:
  - .1 Welding materials: to CSA W59, most recent edition.
  - .2 Welders must be qualified under CSA W47.2.
- .5 Shop applied finish paint: polyester resin powder, to 92GP-12P.
- .6 Fixing of furniture: Bolts, screws, vandal-resistant stainless steel washers

**2.2 FABRICATION**

- .1 Erect work square, plumb, straight, and true, accurately fitted with tight joints and intersections. Provide metalwork descriptions and sizes on drawings. Fabricate all metalwork according to approved shop drawings. Make all curves regular, to indicated radiuses, without ripples or deviations.
- .2 Make laser cuts as indicated on drawings.
- .3 Fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .5 Do not mark surfaces and finish or deform components.
- .6 Ensure required strength and durability of welded joints, and fitted and flush.
- .7 Ensure steel sections are clean and precise, free of nicks, hollows or other imperfections. Overlaps are not allowed.

**2.3 GALVANIZATION**

- .1 File or grind exposed welds smooth and flush.
- .2 Make welds prior to galvanization continuous and sealed.

**2.4 PAINT/STAIN**

- .1 Exterior site furnishings:
  - .1 Spray apply polyester resin powder; Apply powder electrostatically, heat cured to indicated finish, durable and UV resistant. Minimum finish thickness 86 microns.
  - .2 Cure 10 days after painting prior to delivery to site.
  - .3 Paint system performance result:

Criteria	Standards	Results
Moisture resistance	ASTM D-2247	1,500 hours
Salt spray resistance	ASTM B-117 ASTM D-1654	1,500 hours 6 minimum

**2.5 BENCH**

- .1 Materials:
  - .1 Bench for 2 people
  - .2 Reference model: EP 1600-IPE-P-A-Logo-QAV as manufactured by Équiparc.
  - .3 Bench with back and arm rests, hot-dipped galvanized steel reinforced cast aluminum base, painted black.
  - .4 Stainless steel, anti-theft anchor bolts, length suited to anchor in concrete slab located under concrete paving or stone dust.
- .2 Size:
  - .1 Model: Length: 1,804 mm. Depth: 447 mm. Width: 598 mm.

## 2.5 BENCH (cont'd)

- .3 Finish:
  - .1 Colour of steel support and armrest: Baked polyester powder paint, black, mat, uniform.
  - .2 Wood stain colour: Protective oil for selected wood.
  - .3 Logo: Cast aluminum base with Parks Canada logo, painted black.

## 2.6 TABLE

- .1 Materials:
  - .1 Bench for 4 people
  - .2 Reference model: EP 2830-IPE-P-QAV-Logo-QAV as manufactured by Équiparc.
  - .3 Stainless steel, anti-theft anchor bolts, length suited to anchor in concrete slab located under concrete paving or stone dust.
- .2 Size:
  - .1 Model: Length: 1,803. Width: 784. Depth: 1,511 mm.
  - .2 Universal access model: Length: 2425. Width: 784. Depth: 1,511 mm.
- .3 Finish:
  - .1 Welded galvanized steel tubing, painted.
  - .2 Stained Western Cedar surface and bench finish.
  - .3 Steel support colour: Baked polyester powder paint, black, mat, uniform.
  - .4 Wood stain colour: Protective oil for selected wood.

## 2.7 WASTE AND RECYCLING BINS

- .1 Materials:
  - .1 Reference model: No.: W03F32P by Woodridge and distributed by Techsport Canada.
  - .2 Stainless steel, anti-theft anchor bolts, length suited to anchor in concrete slab located under concrete paving or stone dust.
- .2 Size:
  - .1 Model: H: 995 mm, 170 mm for the foot, D: 610 mm.
- .3 Finish:
  - .1 Structure: Lathing and welded aluminum plates.
  - .2 Indoor bin, plastic.
  - .3 Dome cover; black for waste bin and blue for recycling bin.
  - .4 Structure colour: Baked polyester powder paint, black, mat, uniform.

## 2.8 DRINKING FOUNTAIN

- .1 Product:
  - .1 Fountain for water bottles with drinking fountain and fountain for animals.
  - .2 Reference model: 10155SMSS BF by Mobilier urbain, and distributed by Tessier Récréo-Parc or equivalent approved by PCA Representative.
  - .3 Stainless steel, anti-theft anchor bolts, length suited to anchor in concrete slab located under concrete paving or stone dust.
- .2 Size:
  - .1 Model: 711 x 1371 x 457 mm.
  - .2 Weight: 99.79kg.
- .3 Finish:
  - .1 Main structure: 304 stainless steel tubing, 10 gauge, 254 mm diameter.
  - .2 Bowl: 18 gauge electro polished stainless steel composite.
  - .3 Fountain spout: Anti-splash head.
  - .4 Tube for bottles: Recessed sanitary tube
  - .5 Press button: 304 stainless steel
  - .6 Steel support colour: Baked polyester powder paint, black, mat, uniform.
- .4 Shop drawings:
  - .1 Provide complete drawings specifying anchoring method to concrete base and hook-up to sewer and water main connection at 3,00 meter to fountain.

## 2.9 BICYCLE REPAIR STATION

- .1 Product:
  - .1 Cyclohalt bicycle repair station as distributed by Halt or equivalent approved by PCA Representative.  
Painted green, RAL 6005, with French and English instructions in white, placed vertically: Repair station / Station de réparation.  
Two-year manufacturer's warranty.
  - .2 Reference model:  
Bicycle repair station, deluxe model: Model 26347C  
Outdoor pump with dial attached to station. Model 26240  
Tool set. Model: 26268  
Replacement parts:  
One (1) heavy duty pump head. Model:  
Five (5) boxes of two (2) joints for heavy duty pump head. Model: 25345  
T10 Torx key to replace joints on heavy duty pump head. Model: 28967
  - .3 Stainless steel, anti-theft anchor bolts, length suited to anchor in concrete slab located under concrete paving or stone dust.



## **2.5 BICYCLE REPAIR STATION (cont'd)**

- .4 Composition:  
Welded steel structure, TIG and cast aluminum  
Eight (8) repair tools attached with stainless steel cable  
Long tube that doesn't reach the ground
- .5 Colour: Baked polyester powder paint, green /Parks Canada, mat, uniform.

## **2.10 BIKE RACK**

- .1 Materials/product:
  - .1 Galvanized welded steel, painted.
  - .2 Such as CP7, manufactured and distributed by Vélo Rack or equivalent approved by PCA Representative.
  - .3 Stainless steel, anti-theft anchor bolts, length suited to anchor in concrete slab located under concrete paving or stone dust.
- .2 Size:
  - .1 Model: 1460 x 1372 x 764 mm for 4 bikes on one side and 3 on the other.
- .3 Finish:
  - .1 Colour: Baked polyester powder paint, black, mat, uniform.

## **2.11 BOLLARD**

- .1 Materials:
  - .1 Welded aluminum alloy, 6061-T6, painted.
  - .2 Fixed model for concrete base.
  - .3 Removable with anchor embedded in poured concrete and plug when bollard is removed.  
Bollard reference model: PJ-10155SMSS BF as manufactured by Les Agence de l'Est P.J. or equivalent approved by PCA Representative.  
Anchor reference model: PJ 42705AL with cap, plug, anti-theft bolts, as manufactured by the Agence de l'Est P.J. Or equivalent approved by the PCA Representative.  
Heavy duty commercial combination locks.
  - .4 Stainless hardware, anti-theft, with anchor plug on concrete base. Bollard fastening in concrete must be heavy duty.
- .2 Size:
  - .1 Model: Height: 1,200 mm above ground x 127 mm diameter x 6.3 mm deep.
- .3 Finish:
  - .1 Colour: Baked polyester powder paint, black, mat, uniform.
  - .2 Adhesive reflective strips, black and yellow, to MTQ standards (heights and visibility).

## **2.12 MARKING**

- .1 Description:
  - .1 Marking for bike path.
  - .2 BA-CYC model, such as distributed by Signalisation Lévis or equivalent approved by PCA Representative.
  - .3 Concave, resistant to vehicle impact, with asphalt pavement anchors.
  - .4 Size: Height: 122 cm, horizontal yellow strips (4X): 80 mm, horizontal black strips (4X): 56 mm, length: 10.2 cm, width: 0.4 cm.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 INSTALLATION**

- .1 Assemble furnishings in accordance with manufacturer's written recommendations.
- .2 Install furnishings true and plumb as indicated by PCA Representative.
- .3 Touch-up damaged finishes to approval of PCA Representative.

### **3.3 CLEANING**

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

### **3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by site furnishings installation.

**END OF SECTION**



## **PART 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 32 92 23 – Sodding
- .2 32 92 19.13 – Mechanical Seeding
- .3 Section 32 93 10 – Trees, Shrubs and Ground Cover Planting

### **1.2 REFERENCES**

- .1 Agriculture and Agri-Food Canada
  - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
  - .1 PN1340-2005 or more recent, Guidelines for Compost Quality.
- .3 NQ 0605-100 “Aménagement paysager à l’aide de végétaux.”
- .4 NQ 2501-025, 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) (50)), and contain no toxic or growth inhibiting contaminants.
  - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

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

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
  - .1 Indicate source(s) of proposed supply sources to PAC Representative.
  - .2 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties. Toxicology analysis of input values must comply with residential/parklands standards.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS (cont'd)**

- .3 Certificates: Submit documents signed by manufacturer certifying that products and materials comply with performance characteristics and physical properties.
- .4 Provide one (1) sample of each soil type to PAC Representative for approval.
- .5 Approval of each material type will depend on soil analysis results and inspection of samples. Do not commence work indicated under this section until materials have been approved by PAC Representative.

#### **1.5 SOURCE QUALITY CONTROL**

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

#### **1.6 WORK SCHEDULE**

- .1 Complete finish grading to allow sufficient lead time for grassing and planting under optimal conditions.

#### **1.7 ON-SITE STORAGE**

- .1 Store soil in area protected from weather. Cover stockpiled soil with plastic or waterproof membrane.
- .2 Contractor must avoid excessive stockpiling on site or contamination by other materials.
- .3 Locate piles on clean surfaces to prevent contamination, no higher than 1.5 metres.

### **PART 2 PRODUCTS**

#### **2.1 TOPSOIL**

- .1 Topsoil salvaged from landscaping work.
- .2 Topsoil for seeded areas, planting beds: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth
  - .1 Contain no toxic elements or growth inhibiting materials.
  - .2 Finished surface free from:
    - .1 Debris and stones over 50 mm diameter.
    - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

**2.1 TOPSOIL (cont'd)**

- .3 Consistence: friable when moist.
- .3 **Mix No. 1** (for turf and seeding):
  - .1 Composition:
    - .1 45% compost, sand, friable earth, black earth
    - .2 55% recycled content
- .4 **Mix No. 2** (for planting trees, shrubs, perennials and grasses)
  - .1 Composition:
    - .1 55% compost, organic fertilizer, sand, friable earth, black earth
    - .2 45% recycled content
- .5 Characteristics of mixes:
  - .1 General; mixes must be:
    - .1 Free of pesticide residues.
    - .2 Uniform, homogeneous.
    - .3 Must not contain materials bigger than two (2) centimetres in diameter.
  - .2 **Mix No. 1** (for seeding):
    - .1 Organic matter between 4% and 8% (dry).
    - .2 Water pH between 6 and 7.
    - .3 Cation exchange capacity (C.E.C.) above 10 and 20 meq/100 gr of soil.
    - .4 Settlement and compaction: 25%.
    - .5 Bulk density (wet, unsettled) 100 kg/m<sup>3</sup>.
    - .6 P (phosphorous): < 54 ppm.
    - .7 K (potassium): < 90 ppm.
    - .8 Ca (Calcium) less than 4,000 Ppm.
    - .9 Na (Sodium) less than 135 Ppm.
    - .10 Screen size: 50 mm.
  - .3 **Mix No. 2** (for planting trees, perennials and grasses):
    - .1 Organic matter between 8% and 12% (dry).
    - .2 Water pH between 6 and 7.
    - .3 Cation exchange capacity (C.E.C.) above 10 and 20 meq/100 gr of soil.
    - .4 Settlement and compaction: 30%.
    - .5 Bulk density (wet, unsettled): 800 kg/m<sup>3</sup>.
    - .6 P (phosphorous): > 200 Ppm.
    - .7 K (potassium): >200 Ppm.
    - .8 Mg (magnesium): < 67 Ppm.
    - .9 Ca (Calcium) < 535 Ppm
    - .10 Screen size: 20 mm.

**2.1 TOPSOIL (cont'd)**

.6 Particle size:

- .1 Planting soil mix must comply with grading ranges of the BNQ-2501-025 standard, amended for mixed soils (organic and inorganic).

.7 Soil analysis:

- .1 Provide a soil analysis certificate signed by a chemist indicating organic matter, pH, P, K, Mg and Ca as well as particle size distribution if requested, at least 30 days before Work starts.
- .2 Amend soil if it does not comply with the requirements of these specifications.
- .3 Examine soil samples using procedures described in “Méthodes d’analyse des sols, des fumiers et des tissus végétaux – Agdex 533,” of the Conseil des productions végétales du Québec.
- .4 Manufacturer must amend soil to correspond to indicated proportions.
- .5 The manufacturer must amend the soil to the indicated ratios.

**2.2 SOIL AMENDMENTS**

.1 Loam:

- .1 Arable soil (cultivable soil) not too clayey (more or less 50%), nor too sandy (more or less 50%) with organic matter between 4% and 5% for sandy loam and between 2% and 3% for clayey soil. Soil must be free of subsoil, roots, grass clumps, weeds, toxic matter, stones or other foreign matter.

.2 Black soil:

- .1 Decomposing materials, relatively supple and homogeneous, free of colloidal residue, wood, sulphur and iron. Size of shredded particles must be 6 mm or less.
- .2 PH coefficient may vary between 5 and 7. Soil must contain at least 60% organic matter in weight. Adsorption capacity between 150% and 500%.
- .3 Course sand:

- .1 Natural sand only, particle size as follows. No more than 45% of particles passing between two consecutive sieves in the table. Particle size must be determined using CAN/CSA-A23.2-2A test method.

Particle (sieve) size	Percentage passing %
10 mm	95 to 100
5 mm	80 to 100
2.5 mm	50 to 85
1.25 µm	25 to 65
630 µm	10 to 35
315 µm	2 to 10
160 µm	

## **2.2 SOIL AMENDMENTS (cont'd)**

- .4 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous, brown in colour.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded particle minimum size: 5 mm minimum.
- .5 Organic matter: compost Category A, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .6 Fertilizer:
  - .1 Commercial synthetic or preferably organic fertilizer, minimum 65% insoluble nitrogen content. Industry standard product containing nitrogen, phosphorous, potassium and other micronutrients suitable for plants and specific applications or according to soil analyses.
- .3 Limestone:
  - .1 Ground agricultural limestone.
  - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
  - .3 Composition and quantity as recommended by laboratory.

## **PART 3 EXECUTION**

### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

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

### **3.2 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as indicated by PAC Representative after area has been cleared of grasses and removed from site.
- .2 Strip topsoil.
  - .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile topsoil.
  - .1 Stockpile height not to exceed 2 m.



### **3.2 STRIPPING OF TOPSOIL (cont'd)**

- .4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill.
- .5 Protect stockpiles from contamination and compaction.

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

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

### **3.4 PLACING AND SPREADING OF TOPSOIL**

- .1 Place topsoil after PAC Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil as indicated to following minimum depths after settlement:
  - .1 25 mm for topsoil seeding.
  - .2 150 mm for seeded areas (sod, seed).
  - .3 300 mm for flower beds and clumps.
  - .4 500 mm for shrub beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.
- .6 For planting holes, spread topsoil in successive 300 mm layers for planting trees and shrubs, to avoid subsequent settling of soil. Compacting method must be approved in advance by PAC Representative. Soil must be compacted to 90% P.M.

### **3.5 TOPSOIL PLACEMENT AND SPREADING**

- .1 Use surplus topsoil to reseed surfaces. Topsoil depth must not exceed 300 mm.

**3.6 SOIL AMENDMENTS**

- .1 Apply and thoroughly mix soil amendments into full specified depth of topsoil.

**3.7 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
  - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by PAC Representative.
  - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

**3.8 ACCEPTANCE**

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

**3.9 CLEANING**

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

**END OF SECTION**



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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittals.
- .2 Section 32 91 13 – Topsoil Placement and Grading.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Scheduling:
  - .1 Establish schedule for mechanical seeding to coincide with surface preparation.
  - .2 Sowing is carried out immediately after the spreading of potting soil.
  - .3 Unless otherwise specified, seeding periods should be between late thaw and late June (spring) and mid-August to mid-September (fall).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.
  - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and Section 01 35 43 - Environmental Procedures.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

**1.4 QUALITY ASSURANCE**

- .1 Test Reports: submit 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 All work in this section must be carried out in accordance with B.N.Q. 605-030 Aménagement paysager – Engazonnement et ensemencement unless indicated otherwise.

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

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
  - .2 Inoculant containers to be tagged with expiry date.
- .3 Storage and Handling Requirements:
  - .1 Store fertilizer off ground, indoors, in dry location and in accordance with manufacturer's recommendations.
  - .2 Replace defective or damaged materials with new.

## **1.6 ACCEPTATION**

- .1 L'acceptation provisoire des travaux est donnée à l'entrepreneur par PAC Representative, pourvu que :
  - .1 les airesensemencées soient en bonne voie de croissance;
  - .2 les airesensemencées soient sans surfaces dénudées, exemptes de mauvaises herbes et de surfaces où l'herbe ne pousse pas;
  - .3 qu'il soit impossible de discerner la terre lorsque le gazon est coupé à une hauteur de 40 mm.
- .2 L'acceptation finale des travaux est donnée à l'entrepreneur pourvu que :
  - .1 les conditions énoncées à l'article précédent soient maintenues

## **1.7 WARRANTY**

- .1 The Contractor must guarantee seeding work against any significant damage (yellowing, drying, failing, etc.) for a period of 12 months as of the provisional acceptance of the seeding work.
- .2 A financial guarantee representing 15% of the total value of the seeding work may be required. The guarantee starts when the provisional certificate of acceptance is issued.
- .3 The Contractor is responsible for the work site including protection and maintenance until provisional acceptance, and satisfactorily restore surfaces damaged by wind, rain, erosion, work, vandalism, vehicles or any other cause.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.
  - .1 Grass mixture: "Certified", "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
    - .1 Composition of flower and grass seed:
      - .1 80% Schizachyrium scoparium.
      - .2 5% Astragalus canadensis.
      - .3 3.74% Asclepias tuberosa.
      - .4 2.5% Verbena stricta.
      - .5 2.5% Rudbeckia hirta.
      - .6 1.25% Agastache foeniculum.
      - .7 1.25% Aster ptarmicoides.
      - .8 1.25% Aster laevis.
      - .9 1.88% Penstemon digitalis.
      - .10 0.63% Monarda punctata.
    - .2 Composition of cover plant seed:
      - .1 100% annual ryegrass.
- .2 Water: free of impurities that would inhibit germination and growth.
- .3 Fertilizer:
  - .1 To Canada "Fertilizers Act" and Regulations.
  - .2 Synthetic, slow-release, maximum 35% soluble nitrogen, or preferably, organic. Composition: 8-30-12 formula containing 8% nitrogen from two sources, one of which is ammonium sulfate; 30% phosphate, single superphosphate and monoammonium phosphate; 12% potassium, a part of which in the form of sulfate; magnesium, sulphur and minor elements.
- .4 Soil:
  - .1 Soil for seeding to requirements of section 32 91 19 Topsoil Placement and Finish Grading.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for mechanical seeding in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of PAC Representative.
  - .2 Inform PAC Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from PAC Representative.
- .2 Contractor must provide for appropriate drainage and surface runoff system.
- .3 The Contractor must immediately remove soil and other debris from hard surfaces and remove from work site.

### **3.2 PREPARATION OF SURFACES**

- .1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
- .2 Fine grade areas to be seeded free of humps and hollows.
  - .1 Ensure areas are free of deleterious and refuse materials.
- .3 Cultivated areas identified as requiring cultivation to depth of 25 mm.
- .4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.
- .5 Obtain PAC Representative's approval of grade and topsoil depth before starting to seed.
- .6 Apply fertilizer before seeding and work into top five (5) centimetres of soil.

### **3.3 SLURRY APPLICATION**

- .1 Broadcast seed in calm weather when the temperature is above freezing, on ground free of snow, water and mud; use material suited to surfaces to be seeded, either by hand over small surfaces and raked in or by means approved by the PCA Representative.
- .2 Blend application 300 mm into adjacent grass areas or sodded areas previous applications to form uniform surfaces.
- .3 Re-apply where application is not uniform.
- .4 Provide repairs of the area affected by the planting works.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

**3.4 CLEANING (cont'd)**

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Clean and reinstate areas affected by Work.

**3.5 PROTECTION**

- .1 Protect seeded areas from trespass until plants are established.
- .2 Remove protection devices as directed by PAC Representative.

**3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Carry out maintenance work below from the seeding date until the final acceptance of work.
  - .1 Water seeded surfaces in sufficient quantities and intervals to maintain optimal humidity, up to 75 to 100 mm deep. Adjust flow to avoid runoff and dispersal of the soil.
  - .2 Keep grassed areas 95% weed-free.
  - .3 Repair and seed bare patches and dead grass areas to the satisfaction of the PCA Representative. Broadcast seeding same as original is acceptable for small surfaces.
  - .4 Weed by hand or mechanical means as needed using accepted integrated weed management methods.
  - .5 Erect temporary barriers and signposting where necessary to protect newly planted grass.

**3.7 ACCEPTANCE**

- .1 The PCA Representative grants provisional acceptance of the work provided that:
  - .1 Seeded areas are growing well.
  - .2 There are no bare patches, free of weeds.
  - .3 Soil is completely covered.
  - .4 Vegetation is uniform and seeded surfaces are free of bare or eroded areas, dead grass or holes.
- .2 Surfaces seeded in fall will be definitively accepted the following spring one (1) month after the beginning of the growing season, if the conditions required for receipt of the work are accepted.

**END OF SECTION**





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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 32 91 19 13 – Topsoil Placement and Grading.

**1.2 REFERENCES**

- .1 Standards:
  - .1 All work under this section must comply with N.Q. 605-030 “Aménagement paysager – Engazonnement et ensemencement” NQ 0640-050 Gazon en plaques classification et caractéristiques and NQ 0605-300 Produits de pépinières et de gazon unless otherwise indicated.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Scheduling:
  - .1 Schedule sod laying to coincide with preparation of soil surface.
  - .2 Schedule sod installation when frost is not present in ground.

**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 sod and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit:
    - .1 Sod:
      - .1 Install approved samples in 5 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
    - .2 Obtain approval of samples by PAC Representative.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

**1.5 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
  - .2 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

## **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 The contractor must establish a delivery schedule to reduce on-site storage times to a minimum without causing undue delays in execution of the work.
- .3 Roll and place sod to prevent damage during transportation and handling.
- .4 Transport, unload and store sod on palletes only.
- .5 Have sod delivered within twenty-four (24) hours of being harvested and laid within thirty-six (36) hours.
- .6 Do not deliver sod that is too small, asymmetrical or damaged.
- .7 Allow sod to dry sufficiently during humid weather to avoid damage during harvest or handling.
- .1 During dry periods, protect sod to prevent drying out and water sufficiently to maintain vitality and soil loss during handling. Dry sod will not be accepted.
- .2 Sod must be installed upon arrival. Keep sod humid and cool until installation if there is a delay between delivery and installation.
- .3 Deliver and store fertilizer in sealed containers with labels clearly indicating weight, composition and manufacturer's name.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer. E.g., pallets.

## **1.7 SCHEDULE**

- .1 Lay sod when soil is spread.
- .2 Do not harvest or lay sod when soil is excessively dry or when temperature is under 0 °C.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
  - .1 Cultivated grass:
    - .1 Grass, number 1, type 6, Vert à vie brand, low maintenance, containing Kentucky bluegrass and fineleaf fescues, started from certified seed.
    - .2 Composition.
      - 50% Kentucky bluegrass.
      - 30% Red fescue.
      - 10% Chewing fescue.
      - 10% Hard fescue.
    - .3 Loam to sandy loam soil.

## **2.1 MATERIALS (cont'd)**

- .2 Quality of cultivated grass.
  - .1 Grass cover to hide soil at a height 1,500 mm after 50 mm high mow.
  - .2 Maximum mow height: 80 to 100 mm.
  - .3 Soil thickness of sod: 9 to 20 mm.
  - .4 Mature at 24 months.
- .2 Number one nursery sod, Quebec grown (on mineral soil), preferably in proximity to site with seed mix corresponding to intended use and location.
- .3 Sod cultivated and sold in accordance with all quality standards. Sod to have strong, fibrous root system, free of stones, weeds or deficiencies.
- .4 Water:
  - .1 Supplied by Contractor using water tanker.
  - .2 Free of impurities and mineral salts that may hinder plants.
- .5 Fertilizer:
  - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.
  - .2 Complete, synthetic, slow release with 35% of nitrogen content in water-insoluble form or preferably organic.
  - .3 8-30-12: 8% nitrogen from two sources, including aluminum sulphate; 30% normal superphosphate and monoammonium phosphate; 12% potassium with one part in the form of sulfate; magnesium, sulfur and trace elements.
  - .4 Formula and type of fertilizer proposed by Contractor, recommended by the laboratory, according to season and period. Formulas must be identified on establishment and maintenance plan and approved by PAC Representative.
- .6 Grass soil:
  - .1 Grass soil must comply with criteria under 32 91 19 13 – Topsoil Placement and Grading.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Obtain written approval from PAC Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from PAC Representative.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify PAC Representative and commence work when instructed by PAC 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 surface free of humps and hollows to smooth, even grade, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .5 Apply fertilizer before laying sod and incorporate 3.8 kg per 100 square metres to first five (5) centimetres of soil.

### **3.3 SOD PLACEMENT**

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.
- .2 Lay sod within 24 hours of being cut.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.
- .5 Peg sod on slopes on slopes steeper than 1 vertical to 2 horizontal, 5 stakes per metre of grassed surface area.

### **3.4 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
  - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
  - .1 Leave Work area clean at end of each day.

### **3.5 PROTECTION BARRIERS**

- .1 Protect newly sodded areas from deterioration with as directed by PAC Representative.
- .2 Remove after installation PAC Representative.

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

- .1 Carry out maintenance work below as of the date the sod is laid until provisional or substantial completion of work.
  - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
  - .2 Cut grass to 60 mm when or prior to it reaching height of 120 mm.
  - .3 Maintain sodded areas weed free 95%.
  - .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
  - .5 Temporary barriers or signage to be maintained where required to protect newly established sod.
- .2 Carry out maintenance work below during the warranty period, i.e., as of the date of provisional or substantial completion of work until final acceptance of the work.
  - .1 Water sod in sufficient quantities and intervals to maintain optimal humidity levels, up to 75 to 100 mm deep.
  - .2 Repair and seed bare patches and dead grass areas to the satisfaction of the PCA Representative.
  - .3 Keep grassed areas 95% weed-free.
  - .4 Spread fertilizer on grassed surfaces in accordance with the fertilization program established and validated by the PCA Representative. Apply half the quantity required in one direction and the remainder perpendicularly.
  - .5 Erect temporary barriers and signposting where necessary to protect newly planted grass.

### **3.7 ACCEPTANCE**

- .1 Turf Grass Nursery Sod areas will be accepted by PAC Representative.
  - .1 Sodded areas are properly established.
  - .2 Sod is free of bare and dead spots.
  - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 80 mm.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

**END OF SECTION**



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**PART 1      GENERAL**

**1.1      RELATED REQUIREMENTS**

- .1      Section 01 33 00 - Submittal Procedures
- .2      Section 32 91 19.13 – Topsoil Placement and Grading.
- .3      Section 32 01 90.33 – Tree and Shrub Preservation.

**1.2      REFERENCES**

- .1      Definitions:
  - .1      Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.
- .2      References:
  - .1      Agriculture and Agri-Food Canada (AAFC).
    - .1      Plant Hardiness Zones in Canada-2000, most recent edition.
  - .2      Canadian Nursery Landscape Association (CNLA)
    - .1      Canadian Standards for Nursery Stock – most recent edition.
  - .3      Norme NQ 0605-100 « Aménagement paysager à l'aide de végétaux » and NQ 0605-300 « Produits de pépinières et de gazon ».
    - .1      Work in this must be carried out in accordance with industry practices and most recent standards of the Bureau de Normalisation du Québec (BNQ).
  - .4      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
    - .1      Material Safety Data Sheets (MSDS).
  - .5      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      ADMINISTRATIVE REQUIREMENTS**

- .1      Contractor must obtain approval from PAC Representative before commencing work.
- .2      Submit detailed delivery and planting schedule, coordinated with supplier, to PAC Representative for approval. Method and planting times must be submitted for approval and integrated into other site activities.
- .3      Schedule to include.
  - .1      Shipping dates for each supplier
  - .2      Planting Dates.



#### **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 fertilizer, mycorrhiza, anchoring equipment, and mulch and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit samples of mulch (1 litre bag), stake tie and type of rodent protection for approval.

#### **1.5 QUALITY ASSURANCE**

- .1 Compétences
  - .1 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
  - .2 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

#### **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.
  - .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
  - .2 Protect plant material from damage during transportation:
    - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
    - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
    - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
  - .3 Protect plant material from frost, excessive heat, wind, sun and sudden temperature changes during delivery and storage.
  - .4 The Contractor is responsible for unloading plants and for dégâts and damage to plants.
  - .5 The Contractor must also coordinate all delivery and planting operations to minimize time between excavation and planting.
  - .6 Plants damaged due to transportation and handling may be rejected before, during and after planting.
- .2 Storage and Handling Requirements:
  - .1 Store plants in protected, shaded location until they can be planted. Root balls and containers must be covered in mulch (heeled in) and kept humid until planting.

## **1.7 DELIVERY, STORAGE AND HANDLING (cont'd)**

- .2 Protect stored plant material from frost, wind and sun and as follows:
  - .1 For pots and containers, maintain moisture level in containers.
  - .2 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
  - .3 Keep roots moist at all times.
- .3 Store and manage hazardous materials in accordance with manufacturer's written instructions.

## **1.7 SCHEDULE**

- .1 The Contractor must receive approval from the PAC Representative before beginning Work outlined in this section.
- .2 Submit a detailed delivery and planting schedule coordinated with the supplier to the PAC Representative. The method and planting time must be submitted for approval and integrated into the other site activities.
- .3 Submit detailed schedule of work to PAC Representative for approval.

## **1.8 WARRANTY**

- .1 The Contractor must guarantee all plants for a period of twelve (12) months, as of the provisional acceptance of the Work. A financial guarantee may be required by the Owner during this period to guarantee satisfaction with the Work.
- .2 The Contractor must replace dead, deteriorated or defective plants at own expense and according to drawing and plan specifications at his own cost. Replacement plants must be of the same species, size, quality and guarantee as the original plant.
- .3 The Contractor must remove dead plants within the 10 days following notice from the PCA Representative and replace them immediately or as soon as the weather allows for planting (or if the weather is unfavourable, the following planting season).
- .4 The Contractor must have the plants inspected by the PCA Representative at the end of the warranty period.
- .5 The Contractor's warranty includes materials, labour, equipment and tools needed to replace all plants that do not meet the growing conditions required under this section.
- .6 All planting materials and techniques used to replace plants must meet the specifications under this section.

## **PART 2 PRODUCTS**

### **2.1 PLANT MATERIAL**

- .1 General:
  - .1 Plants will be nursery grown and typical of their species. Sizes and species are as shown on the planting list.
  - .2 The PAC Representative must approve the plants at the nursery or on delivery to the site prior to planting. If the Contractor does not do so, the plants may be rejected prior to planting.

## 2.1 PLANT MATERIAL (cont'd)

- .2 Supply of plants:
  - .1 The Contractor must provide all the plants indicated on the bid schedule.
  - .2 Substitutes must receive prior authorization from the PAC Representative.
  - .3 One (1) month after the contract signing, the Contractor must inform the PAC Representative of the source and provide proof of the plant order corresponding to the bid schedule.
  - .4 Planting materials must be first quality and correspond, NQ 0605-300 All plants must correspond to the planting schedule in the planting plan.
  - .5 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.  
Plant sourcing: all plants must have been grown in a hardiness zone corresponding to the hardiness zone where the work is carried out.
  - .6 Plants will be nursery grown.
  - .7 Plants will be inspected and selected at the main production and storage nursery. The supplier must organize and participate in the visit to the nursery to facilitate the inspector's work to find the plants to verify.
- .3 Trees:
  - .1 Quality and supply source:  
Supply first quality nursery trees. Size and development of trees and roots must comply with BNQ standard 0605-300 du BNQ, Written approval is required for trees with root balls smaller than the Standards. Tree size must be measured 30 cm from the ground for trees 100 mm and more in diameter and 15 cm from the ground for trees under 100 mm in diameter. Measure trees when branches are in normal position. Sizes indicated for tree height and branch development are based on the dimension of the main part of the tree and not the distance between branch extremities.
  - .2 Plants will be nursery grown and typical of their species. Sizes and species are as shown on the planting list. Substitutes must receive prior authorization from the PAC Representative. Container plants will be acceptable if cultivated for at least one season, two seasons at most in the same container. Containers must be large enough for development of the roots.
- .4 Shrubs:
  - .1 Provide shrubs with ball of earth, container grown unless otherwise indicated.
  - .2 Container grown shrubs must be as follows:  
Plants must be grown for at least one complete active growing season in containers and must have a sufficiently developed root system to keep the ball of earth intact upon removal from containers.
  - .3 Water free of impurities that would inhibit plant growth.
- .5 Perennials, grasses and herbaceous plants.
  - .1 Specifications for container sizes are written in the planting table. Plant size must be proportional to container size.

**2.1 PLANT MATERIAL (CONT'D)**

.2 Specifications for growth period:

Container size (diameter/volume)	Container growth time (min.)
10 cm	8 weeks
1 litre	6 months
4 litres	2 years

**2.2 WATER**

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

**2.3 STAKES**

- .1 T-bar, steel, 40 x 40 x 5 x 2440 mm, galvanized and painted black.

**2.4 TIES**

- .1 For trees with caliper size of 70 mm or less, rubber "Pro-Tie" type tie, flexible and adjustable, approved by PAC Representative.
- .2 Tie fastener:  
5 mm round screw, for square screwdriver and galvanized steel bolts.

**2.5 TRUNK PROTECTION**

- .1 Nortene type polyethylene mesh guard. The Contractor must wrap the guard around the trunk base, three thicknesses, and fasten the mesh to itself using plastic ties. To a minimum 800 mm height.

**2.6 MULCH**

- .1 RCW mulch composed of hardwood chips, maximum 20% softwood chips. Mulch must be uniform in size not exceeding 50 X 50 X 5 mm and exempt of leaves and branches under 5 mm.

**2.7 FERTILIZER**

- .1 Fertilizers must comply with federal fertilizer law and regulation.
- .2 Synthetic commercial type as recommended by soil test report and manufacturer's recommendations according to period and season. Indicate formulas for planting and maintenance and have validated by PAC Representative.
- .3 Bonemeal, 100% natural, 2-11-0 ratio.
- .4 Mycorise™ growing medium.  
.1 Ensure new roots are in contact with the mycorrhizae (growing medium).  
.2 Use mycorrhizae according to manufacturer's written recommendations.

**2.8 PLANTING SOIL**

- .1 Refer to specifications indicated in Section 32 91 19.13 – Topsoil Placement and Grading.

## **2.9 SOURCE QUALITY CONTROL**

- .1 Obtain approval from PAC Representative of plant material prior to planting.
- .2 Provide necessary import licenses and permits, in compliance with federal, provincial and local regulations.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PRE-PLANTING PREPARATION**

- .1 Proceed only after receipt of written acceptability of plant material from PAC Representative.
- .2 Remove damaged roots and branches from plant material.
- .3 At PAC Representative's request or if otherwise deemed necessary, apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.
- .4 Locate and protect utility lines.
- .5 Notify and acquire written acknowledgment from utility authorities before beginning excavation of planting pits for trees and shrubs.
- .6 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 controls in place. Maintain and repair as necessary.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.3 PREPARATION AND TRANSPORTATION**

- .1 Coordinate delivery of plants with digging to ensure that digging and planting occur at the same time.
- .2 Solidly attach plant branches and protect from rubbing and drastic changes in temperature during transportation.
- .3 Roots must be kept humid after uprooting and approval of plants on site. Protect exposed roots with humid mulch, peat moss, sawdust and other acceptable materials to avoid drying during transportation and storage.

### **3.3 PREPARATION AND TRANSPORTATION (CONT'D)**

- .4 Ship plants from nursery to Work site as quickly as possible.
- .5 The Contractor must transport plants in closed vehicle. Attach branches during transportation. Protect trees from sun, wind and sudden temperatures during delivery and storage.
- .6 The supplier must notify the PAC Representative of the departure from the nursery and the arrival time of the plants at the Work site.
- .7 The Contractor is responsible for unloading plants and for dégâts and damage to plants. Plants rejected at delivery will be returned to supplier.

### **3.4 PLANTING SEASON**

- .1 The Contractor must follow the steps in the planting schedule coordinated with the General Contractor and Owner.
- .2 Do not plant unless conditions are suitable to plant health and growth.

### **3.5 PLANTING**

- .1 Use wood stakes to indicate position of individual trees, shrubs as indicated on drawings and have stake locations approved by PAC Representative before digging.
- .2 Notify PAC Representative of discrepancies with the drawings (location, quantity, etc.).
- .3 Usual planting periods are spring and fall, even if plants are container grown. Special care must be given to plants planted during the growing season to ensure they acclimatize; avoid hot days or lengthy periods of sun. Water abundantly and regularly.
- .4 The Contractor must pay special attention to underground pipes and cables where markers have been put down to avoid damage.

### **3.6 EXCAVATION AND PREPARATION OF PLANTING BEDS**

- .1 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .2 For individual planting holes:
  - .1 Stake out location and obtain approval from PAC Representative prior to excavating.
  - .2 Excavate to depth and width as indicated.
  - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
  - .4 Scarify sides of planting hole.
  - .5 Remove water which enters excavations prior to planting. Notify PAC Representative if water source is ground water.
- .3 Digging:
  - .1 Dig holes and remove excavated material off site or as indicated by the PAC Representative.
  - .2 The Contractor must all necessary measures during excavation to protect existing underground piping.

### **3.6 EXCAVATION AND PREPARATION OF PLANTING BEDS (cont'd)**

- .3 Except where indicated otherwise on the drawings, holes must have vertical sides and with sufficient space to allow for adding soil around the roots.
- .4 Except where indicated otherwise on the drawings, hole diameter must be twice the width of the root ball or large enough to spread roots at least 500 mm on sides.
- .5 When plants are spaced more than 1,500 mm apart, plant in individual holes.
- .6 The Contractor must keep the site clean and the holes dry. Immediately remove the earth and debris accumulated on hard surfaces. Avoid damage to adjacent landscaping or repair damage.
- .7 Protect adjacent areas when digging. Use tarps to hold excavated earth if necessary.
- .8 Do not leave open pits and remove mounds of earth after workday.
- .9 Before planting, remove water in holes, ensuring that water is not underground sourced. Remove debris, branches, stones over 100 mm and other inappropriate material.

### **3.7 PLANTING TREES**

- .1 Backfill soil in 150 mm lifts.
- .2 Protect the trunk, top and root ball during transportation and handling. Use a three-point tree spade with clamp to keep trees in upright position during handling. Equipment must be approved by PAC Representative prior to planting.
- .3 Remove soil from top of rootball and measure to make sure root collar is at the correct height. Make sure plants are straight in the hole; adjust position to blend well with surroundings.
- .4 Place rootball to ensure that collar level is at the same height as surrounding finish grade.
- .5 Orient plant material to give best appearance in relation to structure, roads and walks.
- .6 Loosen burlap and remove 1/3 of the top, taking care not to disturb the rootball. Do not remove the burlap and rope under rootball. In the case of container plants, remove containers without breaking up the rootball.
- .7 Do not leave wrapping materials in holes that are not biodegradable.
- .8 Add and compress by 150 mm, to eliminate air pockets. Do use frozen and water saturated soil. Fill in 2/3 of the hole with soil and the remainder with water. Let the water soak and fill in the hole up to the collar and finished soil level.
- .9 For isolated plantings, form a watering saucer (well) with substrate 100 to 150 mm high with the inner diameter of the well the same size as the exterior perimeter of the hole. Cover the berm with mulch within 15 cm of the tree trunk.

### **3.8 PLANTING TREES OF SMALL CALIBRATIONS, SHRUBS**

- .1 Always remove plants from container.
- .2 Fill holes in successive layers of well crumbled soil, placed carefully between the roots, compressed and stabilized with water, to eliminate air pockets.
- .3 Tamp soil carefully to avoid crushing or breaking roots.
- .4 Do not plant in soil that is too wet or compacted.
- .5 Make a well around the plantings to retain water.
- .6 Ensure plant collars are even with finish grade of beds.

### **3.9 PRUNING**

- .1 Plantings require minimal trimming at planting time, if transported properly.  
Cut away dead, dry or damaged branches or parts of branches.  
Remove stems, parts of stems and twigs that are dead, dry, damaged or mishapen.  
Trim back healthy, very long or straggly branches in keeping with specific requirements of plant species or cultivar. Follow instructions of specialized overseer.

### **3.10 FERTILIZATION**

- .1 Trees: mix in the following with soil:
  - .1 200 grams 2-11-0 fertilizer (bonemeal)/tree.
  - .2 500 ml Mycorise Pro Végétalisation/tree.
- .2 Shrubs: mix in the following with soil:
  - .1 100 grams 2-11-0 fertilizer (bonemeal)/tree.
  - .2 100 ml Mycorise Pro Végétalisation/tree.
- .3 Perennials, grasses and herbaceous plants.
  - .1 Slow release granular fertilizer, 10-25-20 organic base, 3.8 kg/100 m<sup>2</sup>/plant;
  - .2 30 ml mycorrhizae/plant.

### **3.11 TRUNK PROTECTION**

- .1 Install trunk protection on deciduous trees as indicated.
- .2 Install trunk protection before installation of tree supports.

### **3.12 TREE SUPPORTS**

- .1 Deciduous tree (45 mm and more in diameter):
  - .1 Fill in 2/3 of hole and drive in T-bar stakes, taking care not to damage main roots. Install stakes, two per tree, 150 mm from trunk on prevailing wind side. Attach trunk to stake with collars. Stakes must remain in place for a minimum of two (2) years. Equipment remains the owner's property.



### **3.12 TREE SUPPORTS (cont'd)**

- .2 Do not alter collars, except in the case of a modified collar.
- .3 Collar screws must not be longer than 5 mm past nuts once collar is attached.
- .4 Collars and stakes must be compatible to ensure solid, safe installation.

### **3.13 MULCHING**

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Mulch beds as indicated by PAC Representative.
- .3 Ensure soil settlement has been corrected, and remove debris and weeds prior to mulching.
- .4 Spread mulch evenly 100 mm thick. If mulch is likely to blown away, wet and mix with a little soil.

### **3.14 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following maintenance operations from time of planting to acceptance by PAC Representative.
  - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
    - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
    - .2 Water planted and transplanted plants within the area beneath the tree canopy up to 15 cm deep. Watering must be done successively to enable the water to be absorbed into the mulch and to prevent runoff.
    - .3 Water twice a week during peak hot weather, and allow for up to an average 1,000 litres (1 m<sup>3</sup>) per tree per watering.
  - .2 Remove weeds monthly.
  - .3 Replace or respread damaged, missing or disturbed mulch. Repair damaged watering basins.
  - .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
  - .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from PAC Representative prior to application.
  - .6 Remove dead or broken branches from plant material.
  - .7 Keep trunk protection and guy wires in proper repair and adjustment.
  - .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
  - .9 Spread fertilizer early in spring based on soil tests and fertilization schedule.
  - .10 At the end of the warranty period, remove the protection from around the tree trunks and stakes and level off the watering basins.

**3.14 MAINTENANCE DURING ESTABLISHMENT PERIOD (suite)**

- .11 Submit written report to PCA containing the following information.
  - .1 Maintenance work undertaken.
  - .2 Development and condition of the plants.
  - .3 Necessary preventive or corrective measures not provided by the Contractor.

**3.15 CLEANING**

- .1 Progress Cleaning: Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**3.16 PROVISIONAL ACCEPTANCE OF PLANTING WORK**

- .1 Once planting work is completed, provisional acceptance is given after verified and approved by PAC Representative.
- .2 Provisional acceptance of planting work will be given, provided that:
  - .1 All plant materials installed on the site are healthy and meet normal growth conditions.
  - .2 Comply with requirements of planting list regarding species and size.
  - .3 Planting materials are insect and disease free.
- .3 Labels identifying plants are removed after provisional acceptance.

**3.17 FINAL ACCEPTANCE OF PLANTING WORK**

- .1 Final acceptance of work will be granted after the warranty period following provisional acceptance of the last step, provided all conditions are met.

**END OF SECTION**



## **PART 1 GENERALITIES**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures;
- .2 Section 01 61 00 – General Product Requirements;
- .3 Section 01 74 11 – Cleaning;
- .4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

### **1.2 REFERENCE STANDARDS**

- .1 American Association of State Highway and Transportation Officials (AASHTO)
  - .1 AASHTO M180 - [2000(2004)], Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrails.
- .2 ASTM International
  - .1 ASTM A123/A123M - [09], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM A307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .3 CSA International
  - .1 CSA G40.20 / G40.21 - General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel
  - .2 CAN/CSA, Série O80-[F08], Wood Preservation.
- .4 Ministry of Transport Québec (MTQ):
  - .1 Responsibilities and General specifications - Road Infrastructures - Construction and Repair (CCDG) 2019 edition;
  - .2 Standard 6201, Steel bolts, anchor bolts, nuts and washers;
  - .3 Standard 6301, Sliding Elements, End Sections and Accessories in Galvanized Steel for Guide Rails, version 2018-12-15;
  - .4 Standard 11101, Wood, version 2018-12-15;
  - .5 Standard 14101, Retroreflective Film, version 2018-12-15.
- .5 The Society for Protective Coatings (SSPC)
  - .1 Surface Preparation Standard No. 11. Power-Tool Cleaning to Bare Metal

### **1.3 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit certificates of compliance at least three (3) weeks prior to the start of work for:
  - .1 Treated Wood Posts and Offset Blocks
    - .1 For each delivery of treated wood poles and blocks, the Contractor must provide the PCA Representative with one or more compliance certificates, as specified in MTQ Standard 11101.

- .2 The following information should appear on the certificate of conformity:
  - .1 The name of the supplier;
  - .2 The name of the contractor;
  - .3 The contract number;
  - .4 The delivery date;
  - .5 Quantity delivered per production batch.
- .2 Guide Rails
  - .1 For each delivery of guide rail elements, including end sections and sliding members, the Contractor must provide the PCA Representative with one or more compliance certificates, as specified in MTQ Standard 6301.
  - .2 The following information should appear on the compliance certificate for each production lot:
    - .1 The name of the galvanizing company;
    - .2 Place and date of galvanizing;
    - .3 Steel grade;
    - .4 Casting number;
    - .5 Mechanical properties;
    - .6 Chemical composition;
    - .7 Thickness of the coating;
    - .8 The number of the production lot.
  - .3 A production lot consists of structural steel parts of the same grade, the same resilience, the same dimensions and from the same casting.
- .3 Bolts, Nuts and Washers
  - .1 For each delivery of bolts, nuts and washers, the Contractor must provide the PCA Representative with compliance certificates, as specified in MTQ Standard 6201.
  - .2 The following information should appear on the compliance certificate:
    - .1 Distributor's Name;
    - .2 Standards that are met for each element;
    - .3 Nominal dimensions;
    - .4 Identification of bolt marking;
    - .5 Bolt production lot number;
    - .6 Information on the coating.
  - .3 A production lot consists of parts of the same dimensions from the same steel casting.

## 1.4 QUALITY ASSURANCE

- .1 Treated Wood Posts and Offset Blocks
  - .1 For field acceptance, the treated wood must comply with all the requirements of article 18.5.1.2 of the CCDG 2019, Ministry of Transport of Quebec.

- .2 The treatment of pressure wood must be carried out by a company whose plant holds a registration certificate attesting that the quality system meets the ISO 9001 standard "Quality Management Systems".
- .3 The Contractor shall provide the PCA Representative with a copy of the ISO 9001 "Quality Management Systems" certification upon the first delivery of each of its suppliers.
- .2 Guide Rails
  - .1 For field acceptance, the guide rails must comply with all the requirements of article 18.5.1.3 of the CCDG 2019, Ministry of Transport of Quebec.
  - .2 Guide rail sliding members shall be produced by a manufacturer whose plant has a registration certificate attesting that the quality system is in accordance with the ISO standard.
  - .3 End sections of guide rails to be produced by a manufacturer whose plant has a certificate of registration certifying that the quality system is ISO compliant.
  - .4 The Contractor shall provide the PCA Representative with a copy of the ISO 9001 "Quality Management Systems" certification upon the first delivery of each of its suppliers.
- .3 Bolts, Nuts and Washers
  - .1 For field acceptance, bolts, nuts and washers must comply with all the requirements of article 18.5.1.4 of the CCDG 2019, Ministry of Transport of Québec.
- .4 Film
  - .1 For field acceptance, films must comply with all the requirements of article 18.5.1.5 of the CCDG 2019, Ministry of Transport of Quebec.
- .5 Any non-conformities shall be corrected and approved by the PCA Representative prior to the commencement of work.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect guide rails from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: Recupérate packaging waste for reuse or recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management Disposal.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Guide rails in W steel sections, as indicated on plans and in accordance with the following standards:
  - .1 Standard 6301, Volume VII, Chapter 6 (MTQ);
  - .2 Standardized Drawing GSR-006, Volume VIII, Chapter 3 (MTQ)
  - .3 Standardized Drawing GSR-005B, Volume VIII, Chapter 3 (MTQ)
  - .4 Standardized Drawing GSR-045, Volume VIII, Chapter 3 (MTQ).
  - .5 Standardized Drawing GSR-048, Volume VIII, Chapter (MTQ).
  - .6 Hot dip galvanization in accordance with ASTM A123/A123M.
- .2 Bolts, nuts and washers: as indicated on plans and in accordance with the following standards:
  - .1 Standard 6201, Volume VII, Chapter 6 (MTQ);
  - .2 Standardized Drawing GSR-050, Volume VIII, Chapter 3 (MTQ).
  - .3 ASTM A307 and hot dip galvanization in accordance with ASTM A123/A123M.
- .3 Treated Wood Posts and Offset Blocks, as indicated on plans and in accordance with the following standards:
  - .1 Standardized Drawing GSR-001, Volume VIII, Chapter 3 (MTQ);
  - .2 CAN/CSA, Series O80-[F08], Wood Preservation;
  - .3 Standard 11101, Volume VII, Chapter 11 (MTQ).

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 REMOVAL AND DEMOLITION OF EXISTING GUARD RAILS**

- .1 The Contractor shall remove existing guide rails, including all accessories and anchorage systems and dispose of them at a location acceptable to the PCA Representative.
- .2 In addition, the Contractor must backfill the holes using granular materials in accordance with the BNQ 2560-114 standard "Civil Works - Aggregates", "Part II: Foundation, sub-foundation, base courses for driving and shoulder surfaces" for sub-foundation granular materials, and after the installation of materials, compacting them in layers of 150 mm thick.

### 3.3 ERECTION

- .1 Set posts by instrument for alignment, and locations as indicated on drawings and as directed by the PCA Representative.
- .2 The Contractor shall install the posts so that the tops of the posts follow a regular line. The vertical alignment of the posts must not duplicate imperfections in the road and shoulders.
- .3 Excavate post holes to depths as indicated and to diameter of 360 mm plus or minus 20 mm.
  - .1 Compact bottom to provide firm foundation.
  - .2 Set post plumb and square in hole.
- .4 Backfill around posts using excavated material and compact in uniform layers not exceeding 150 mm compacted thickness up to required elevation. Finished grade as per landscape architects' drawings.
- .5 Construct anchorages to details indicated on drawings and in accordance with applicable MTQ Standards.
- .6 Install double-corrugated steel profile guide rails on wood posts as shown on detail drawings. Overlap the joints in the direction of the traffic.
  - .1 In the case of double corrugated steel profile sliding elements and accessories, the bolts must be tightened with a manual or equivalent wrench to obtain a tightening torque of at least 100 N • m, without deforming the elements to be assembled.
  - .2 Bolts must not protrude more than 12 mm from the nut.
  - .3 For the fastening of double-corrugated steel profile sliding elements on wooden posts, the bolts must be tightened using a jaw wrench approximately 400 mm in length, without deforming the elements to be assembled.
  - .4 After tightening, the threaded end of the bolts and anchor rods must exceed the nut by at least 3 mm.
  - .5 Installation tolerances: in accordance with article 18.5.3.6 of the CCDG (2109).
- .7 The Contractor shall install the plates and retro-reflective films indicated on plans and specifications.
  - .1 Galvanized steel surfaces to receive retroreflective films should be cleaned with a pad, soaked in a 5 to 8% concentrated phosphoric acid solution and rinsed with clean water.
  - .2 On the wood, the aluminum plates on which the films are fixed must be installed by means of galvanized nails.

### 3.4 CONNECTING TO AN EXISTING GUIDE RAIL

- .1 The end or the beginning of a guide rail replacement section at some locations is to be connected to an existing slide section. In this case, the guide rails must be connected to the junction of two rails. However, in those cases where it is not possible, the existing guide rail must be cut, adapted or adjusted to achieve a safe assembly in accordance with the applicable standards.



### **3.5 GALVANIZED STEEL TOUCH-UP**

- .1 Damaged surfaces less than or equal to 2.5 cm in width must be repaired by brushing on two coats of a zinc-rich coating with a minimum of 87% zinc metal in the dry film. In addition, on the same piece, the total surface to be repaired by a zinc-rich coating must be less than or equal to 0.5% of the total surface thereof.
- .2 Damaged surfaces must be cleaned in accordance with SSPC - SP 11 "Power Tool Cleaning to Bare Metal". The minimum total thickness of the dry coating film must be 130 µm.
- .3 Parts with damaged surfaces greater than 2.5 cm wide or more than 0.5% of the total area of the part must be replaced or re-galvanized.

### **3.6 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 or 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.

### **3.7 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by guide rail installation.

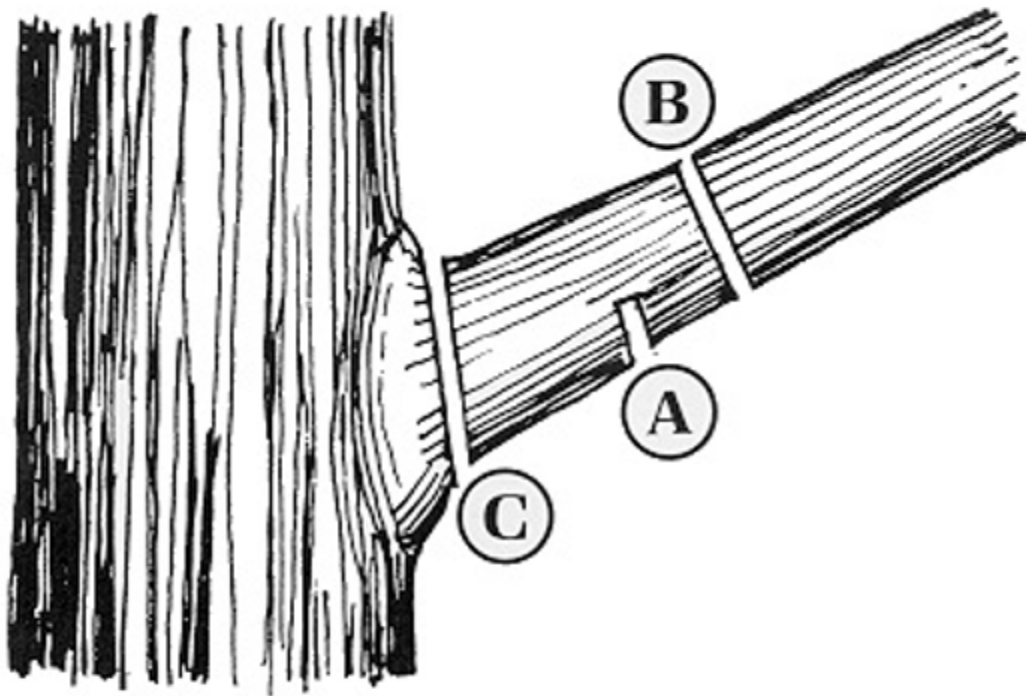
**END OF SECTION**







## Appendix 1 - Proper Pruning Method



To find the proper place to cut a branch, look for the branch collar, an often visible swelling that forms at the base of a branch where it is attached to its parent branch or to the tree's trunk. On the upper surface, there is usually a branch bark ridge that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.

- A – The first cut is a shallow undercut to prevent bark tearing
- B – The second cut completely removes the limb
- C- The third cut removes the stub and is cut flush with the branch collar







Company logo

**Project Name**

**Location**

**Environnemental protection plan (EPP)**

**Project #**

**Date**

**Contractor name**



## Table des matières

Document modifications follow-up .....	2
EPP Objective .....	2
Environmental Protection Plan (EPP).....	3
1. Contact Information .....	3
1. Worker awareness of EPP.....	3
2. Environmental Regulatory Framework.....	4
3. Erosion and sedimentation control.....	4
4. Procedure for refueling and maintenance of equipment .....	5
5. Wastewater, Stormwater and Pump Water Management Plan .....	5
6. Excavated soil management plan.....	6
7. Vegetation protection.....	6
8. Residual Materials and Hazardous Materials Management Plan .....	7
9. Protection of wildlife .....	8
10. Protection of aquatic environments.....	8
11. Dust and emission control .....	8
12. Noise control .....	8
13. Modalities of restoration of the site at the end of the works .....	8
14. Emergency Response and Environmental Prevention .....	9
Annexe 1. Mobilization plan.....	9
Annexe 2. Environmental surveillance plan .....	10
Additional Annexes .....	10

## **Document modifications follow-up**

Modification number	Date	Author(s)	Brief modification description
1.0	[yyyy-mm-dd]	[Name of author]	Document Creation.

## **EPP Objective**

An Environmental Protection Plan (EPP) is a document that describes site-specific environmental protection measures and responsibilities during the implementation of a project. An EPP is designed to ensure that the environmental mitigation commitments and measures outlined in the specifications are properly understood and implemented by the Contractor. The EPP must contain specific and direct guidelines to achieve the targeted environmental outcomes in the mitigation measures.

The "ENVIRONMENTAL PROTECTION" section of the quotation contains a non-exhaustive list of indications on the EPP. This list may include, for example, the following:

- The Contractor must submit an Environmental Protection Plan to the Government Representative for review and approval prior to the commencement of construction activities or the delivery of materials and equipment to the site;
- The plan should provide a comprehensive overview of known or potential environmental problems to be addressed during construction and of applicable safeguards to mitigate environmental impacts;
- The actions included in the environmental protection plan must be presented per a level of detail which agrees with the environmental problems and with the construction work to be carried out.

# Environmental Protection Plan (EPP)

\*Please insert a nomenclature into a subsection, ex 1.1, 1.2, 1.3, etc.

## **1. Contact Information**

*The objective of this section is to identify the persons responsible for the implementation of the EPP.*

The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:

- The names of the persons responsible for ensuring compliance with the plan;
- The names and skills of the persons responsible for the exit signs for residual hazardous materials to be evacuated from the site.

Specifically, this section should include, but is not limited to:

- The name and contact information of the Contractor's representative responsible for the implementation of the EPP;
- The names of Parks Canada staff involved in the environmental component of the project;
- The names of other project contacts with key environmental responsibilities;
- Environmental responsibility of each stakeholder;
  - o An organizational chart of the Contractor and the communication chain.

## **1. Worker awareness of EPP**

*The objective of this section is to describe the Entrepreneur's strategy to ensure that its staff is aware of the content of the EPP, is aware of the environmental issues at the site of work and is adequately trained in the implementation of the EPP.*

The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:

- The names and qualifications of the persons responsible for the training of construction site personnel;
- A description of the training program for personnel assigned to the protection of the environment.

Specifically, this section should include, but is not limited to:

- Strategy for training workers prior to work;
- The EPP communication strategy for workers, for example:
- Review of environmental issues and measures at start-up and construction meetings;
  - o Discussion of the environmental aspect in daily work planning meetings

## **2. Environmental Regulatory Framework**

*Include in this section a list of environmental notices, permits, approvals and approvals received prior to construction. A copy of these documents must be at all times at the site.*

*The main environmental restrictions and requirements outlined in these documents are to be found in this section.*

*Any other regulatory compliance measures affecting or restricting the construction project (ex critical periods for wildlife protection) should also be included in this section.*

## **3. Erosion and sedimentation control**

*The purpose of this section is to develop an erosion and sediment control plan for all periods of construction and reclamation. This plan must be adapted to the scope of the project and the associated risks. The plan must define concretely the means and techniques used to control the sediments and the location of the facilities.*

*The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:*

- *A plan for the prevention of erosion and sediment transport, indicating the measures to be implemented, including monitoring of work and reporting to verify compliance with federal laws and regulations, Provincial and municipal governments.*
- *Traffic control plans, including measures to reduce the erosion of temporary road platforms by the movement of construction vehicles, particularly in rainy weather. These plans must include measures to reduce the transport of materials on public roads by vehicles or runoff.*

Specifically, this section should include, but is not limited to:

- Identification of areas at risk (ex watercourses, wetlands, steep slopes, etc.);
- Erosion prevention procedures (ex timing of project implementation, minimization of site area to the minimum required, management of the area under construction, land cover measures);

- Sediment control measures (ex sediment barriers, filter berm, sediment traps, etc.), including the usual specifications and drawings of sediment control structures (may be included in the annex);
- Detailed work plans for aquatic structures, including site isolation and project timelines;
- Water management plans, including on-site controls, equipment, and proposed drainage areas;
- Areas where erosion and sediment control measures are applied (indicate on the plan in Appendix 1);
- Monitoring of control measures, preventive measures, and corrective measures (ex repairs);
- Removal of non-biodegradable materials when the area is stabilized.
  - o Any other requirements specified in the specification and the mitigation table for erosion and sediment control.

#### **4. Procedure for refueling and maintenance of equipment**

*The purpose of this section is to identify measures to protect the environment during maintenance and refueling of machinery and equipment. Planned supply areas should be identified on the mobilization plan in Appendix 1.*

#### **5. Wastewater, Stormwater and Pump Water Management Plan**

*The purpose of this section is to define on-site water management, including wastewater, storm water inside and outside the site, and pumping water (ex, drying a work area or keep dry excavations).*

The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:

- A run-off and leach management plan, indicating the measures that will be implemented to prevent any discharge of the water coming from the site into the surrounding aquatic environment;
- A wastewater management plan, indicating the methods and procedures to be used for the management or disposal of wastewater directly from construction activities, eg water used for concrete curing, Cleaning / discharging, grounding, disinfection, hydrostatic testing and rinsing of pipelines.

More specifically, this section should include, but is not limited to:

- Pre-discharge sites approved by Parks Canada;
- Methods of confinement and recovery of wastewater from the site (eg cleaning water from concrete surfaces, cleaning water from concrete pumps, runoff water, etc.);
- Water treatment methods, if required;
- Control of turbidity in the aquatic environment;

- Methods of verifying compliance with applicable quality criteria for water discharged into the aquatic environment;
- Any other requirements specified in the estimate and the mitigation measures table for on-site water management.

## **6. Excavated soil management plan**

*This section is complementary to section 4 on erosion and sediment control. It aims to detail temporary storage measures for excavated soil during the work, contaminated soil management methods, where appropriate, and protection of the environment during the period of soil disturbance.*

More specifically, this section should include, but is not limited to:

- Temporary storage areas (indicate in the mobilization plan in Appendix 1);
- Methods for stabilizing slopes and disturbed soils;
- Methods for managing soils during temporary storage (excavated soil to be reused and soils disposed off-site);
- The name of the center (s) to which the contaminated soil will be sent, if applicable;
- Details on the concrete implementation of the measures specified in the estimate for contaminated soil management, where applicable;
- Any other requirements specified in the specification and the mitigation table for soil and excavation management.

## **7. Vegetation protection**

*The objective of this section is to indicate the means that will be put in place to protect the vegetation on the site and outside the site near taxiways and access roads, to plan for the management of undesirable species, and specify the trees and shrubs to be felled or pruned for the purposes of the work. Any intervention on vegetation must be validated and authorized by Parks Canada.*

More specifically, this section should include, but is not limited to:

- Measures to manage irritant species and invasive alien species (ex, phragmite), including methods of cleaning machinery and means of disposing of plant residues;
- Measures to protect trees and shrubs against damage and disturbance caused by the work;
- Identification and location of trees to be felled and pruned, previously approved by Parks Canada;

- If required, a pesticide treatment plan approved by the Parks Canada process;
- Any other requirements specified in the specification and the mitigation table for vegetation management.

## **8. Residual Materials and Hazardous Materials Management Plan**

*Indicate in this section waste management measures, including hazardous and non-hazardous residual materials. This section should also include measures for the storage and handling of hazardous materials used on site.*

The "CONSTRUCTION WASTE / DEMOLITION MANAGEMENT AND DISPOSAL" section of the estimate contains a non-exhaustive list of waste management and waste reduction measures. This list may include, for example, the following:

- Before starting work, meet with the Government Representative to review the waste management objectives and waste reduction plan for the construction, renovation and demolition (CRD) waste generated by the project.
- The waste management objective is to reduce as much as possible the total flow of construction / demolition waste to landfills.
- Provide the Government Representative with documents certifying that comprehensive measures and procedures for waste management, recycling, reuse / reuse of recyclable and reusable / re-employable materials have been implemented.
- Minimize the amount of non-hazardous solid waste generated by the work; Maximize the reduction at source, reuse / reuse and recycling of solid waste produced by CRD activities.

The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:

- A plan for the disposal of non-hazardous residual materials, hazardous or special residual materials including methods and sites for the disposal of solid waste and debris from clearing.
- A plan for the prevention of contamination indicating the potentially hazardous substances to be used on the site, measures to prevent the substances being suspended in the air or introduced into the soil, as well as the details of the measurements that will be taken to ensure that the storage and handling of these substances are in compliance with federal, provincial and municipal laws and regulations.

This section should include, but is not limited to:

- Waste management measures, including hazardous and non-hazardous waste;
- Measures for the storage and handling of hazardous materials used on site;
- Container and hazardous material shelter locations (indicate in the mobilization plan in Appendix 1);
- The procedure for the management and disposal of concrete surplus from concrete pumps;
- Any other requirements specified in the specification and the mitigation measures table for the management of residual materials and hazardous materials.

## **9. Protection of wildlife**

*Indicate in this section the requirements specified in the estimate and the table of mitigation measures to protect terrestrial, aquatic, and avian wildlife.*

## **10. Protection of aquatic environments**

*The purpose of this section is to identify the means to meet the requirements of the estimate and the mitigation table to protect aquatic environments (rivers, canals, wetlands, etc.). Among other things, indicate ways of preventing the dispersal of invasive exotic species (ex zebra mussels).*

## **11. Dust and emission control**

*Indicate in this section the requirements specified in the specification and the table of mitigation measures that aim to minimize emissions of fine particulate matter and greenhouse gases into the air.*

The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:

- A plan for the prevention of air pollution, specifying measures to retain dust, debris, materials and residual materials inside the site.

## **12. Noise control**

*Indicate in this section the requirements outlined in the quote and the table of mitigation measures to minimize noise and inconvenience to site visitors and area residents as appropriate.*

## **13. Modalities of restoration of the site at the end of the works**

*The objective of this section is to specify the planned restoration measures at the end of the work.*



## **14. Emergency Response and Environmental Prevention**

*This section should specify steps for emergency response, particularly in the case of a spill of oil or other hazardous materials.*

The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:

- A spill contingency plan that includes procedures to be followed, instructions to be followed and reports to be produced in the event of an unpredictable spill of a controlled substance.

Specifically, this section should include, but is not limited to:

- List of products and materials considered or defined as hazardous or toxic to the environment. These products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot-melt rubber membrane materials, bituminous cement, sand blasting agents, paint, solvents, and hydrocarbons;
- Equipment required on site;
- The contents and location of on-site recovery kits;
- Procedures for refueling and storing fuel;
- Spill prevention procedures (containment and storage of materials, safety, handling, use and disposal of empty containers, surplus products or waste generated by the application of these products in accordance with federal and provincial force);
- The spill response procedure (containment, cleaning, disposal of contaminated materials, etc.);
- An Incident Report Form to report spills (if included as an appendix, refer to them here);
- An up-to-date contact list for emergency response (Parks Canada, Environment Canada, Coast Guard, etc.), including information required to report spills.
- A fire emergency response plan;
- Any other requirements specified in the specification and the mitigation measures table for the management of spills and environmental emergencies.

## **Annexe 1. Mobilization plan**

*This schedule must include a plan identifying all elements that can be located in relation to environmental issues and the protection of the environment in the mobilization area and the machinery lanes.*

The "ENVIRONMENTAL PROTECTION" section of the estimate contains a non-exhaustive list of the elements to be contained in an EPP. This list may include, for example, the following:

- Drawings showing the location of temporary excavations or site paths in embankments, materials, constructions, sanitary installations, deposits of surplus materials or contaminated materials; The drawings illustrating the methods that will be used to control runoff and to confine the materials to the site.
- A plan of the work area showing the activities planned in each part of the works area and indicating the areas of restricted use as well as the prohibited areas of use. This plan shall include measures to mark the boundaries of usable areas and methods of protection of the elements within authorized work areas to be preserved.

Specifically, this section should include, but is not limited to:

- Location of trees to be felled and trees to be protected (tree felling must be approved in advance by Parks Canada);
- Excavation areas;
- Temporary lanes and access;
- The location of temporary facilities (ex, platforms, cofferdams, etc.);
- Storage areas for excavated soils and other stacked materials, where applicable;
- Storage areas for building materials and debris;
- Location of erosion prevention equipment (ex, sediment barrier);
- Location of maintenance and refueling areas for machinery;
- Location of hazardous material shelters and waste containers;
- Location of oil recovery kits;
- The location of the confined enclosure for concrete surplus, where applicable;
- Location of water treatment facilities, where applicable (settling pond, etc.);
- Identified sites for the discharge of water into the environment.
- Etc.

## **Annexe 2. Environmental surveillance plan**

*Include a periodic monitoring report that captures the main measures of each section of the EPP to systematically check on their implementation and their proper functioning.*

### **Additional Annexes**

Add annexes to include the following:

- Material Safety Data Sheets;
- Data sheets on sediment containment methods (ex sediment barrier) or other specific equipment related to the environment used on the site;
- Management of nonconformities;
- Relevant shop drawings and drawings.





Cima+

## ÉTUDE GÉOTECHNIQUE

Lieu historique du canal de Chambly  
Tronçon de la piste cyclable  
Avenue Bourgogne, Chambly, Québec

025-B-0020632-1-GE-R-0001-01

AVRIL 2019



VERSION RÉVISÉE





Rédigé par :

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Chargée de projet - Géotechnique  
Membre de l'OIQ n° 504302

Révisé par :

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Arpentage des sondages	Services Topo.
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## Sous-traitants

Réalisation des forages Forage André Roy inc.

Registre des émissions		
N° de révision	Date	Description
01	10 avril 2019	Révision du rapport final
00	3 avril 2019	Rapport final

Distribution	
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# Table des matières

<b>1</b>	<b>INTRODUCTION</b> .....	<b>1</b>
<b>2</b>	<b>DESCRIPTION DU SITE ET DU PROJET</b> .....	<b>2</b>
<b>3</b>	<b>MÉTHODE DE L'ÉTUDE</b> .....	<b>3</b>
3.1	Travaux sur le site .....	3
3.1.1	Localisation, implantation et nivellement des sondages.....	3
3.1.2	Forage.....	3
3.2	Programme d'essais et analyses en laboratoire .....	4
3.2.1	Essais géotechniques .....	4
<b>4</b>	<b>PRÉSENTATION DES RÉSULTATS</b> .....	<b>5</b>
4.1	Nature et propriétés des matériaux .....	5
4.1.1.1	Revêtement en place.....	5
4.1.1.2	Fondation granulaire.....	5
4.1.1.3	Remblai .....	6
4.1.1.4	Sol naturel .....	6
<b>5</b>	<b>EAU SOUTERRAINE</b> .....	<b>7</b>
<b>7</b>	<b>DISCUSSION ET RECOMMANDATION – VOLETS GÉOTECHNIQUE ET CHAUSSÉE</b> .....	<b>8</b>
7.1	Stabilité de la piste cyclable .....	8
7.2	Structure de chaussée .....	8
7.2.1	Matériaux du sol-support.....	8
7.2.2	Sollicitation par les camions.....	8
7.2.3	Structures de chaussée .....	9
7.2.4	Préparation de l'infrastructure .....	11
7.3	Recommandations relatives aux matériaux de chaussée .....	12
7.3.1	Bitume pour enrobés.....	12
7.3.2	Granulats pour enrobés bitumineux.....	12
7.3.3	Granulats pour fondation et sous-fondation (emprunt) .....	12

## Tableaux

Tableau 1	Programme des essais en laboratoire.....	4
Tableau 2	Résumé des matériaux interceptés au droit des forages.....	5
Tableau 3	Résultats des analyses granulométriques par tamisage – fondation granulaire....	6
Tableau 4	Résultats des limites de liquidité et de plasticité – Remblai.....	6
Tableau 5	Résultats des limites de liquidité et de plasticité – Remblai.....	6
Tableau 6	Relevés du niveau d'eau mesuré dans l'instrument.....	7
Tableau 7	Structure de chaussée proposée -piste cyclable .....	10
Tableau 8	Structure de chaussée proposée -dalle de béton extérieure .....	11
Tableau 9	Caractéristiques intrinsèques et de fabrication (Norme 2101 du Tome VII – Matériaux du MTQ).....	12
Tableau 10	Caractéristiques mécaniques et physiques des granulats de fondation et de sous-fondation (emprunt) .....	13

## Figure

Figure 1	Localisation du site à l'étude (tirée de Google Earth) .....	2
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## Annexes

Annexe 1	Portée et limitation de l'étude
Annexe 2	Note explicative et rapport de forage
Annexe 3	Résultats des essais de laboratoire
Annexe 4	Plan de localisation du forage
Annexe 5	État de la surface

# 1 Introduction

Les services d'Englobe ont été retenus pour effectuer une étude géotechnique dans le cadre du projet de réhabilitation d'un tronçon de la piste polyvalente du lieu historique du Canal-de-Chambly, situé sur l'avenue Bourgogne, à Chambly, province de Québec.

Les travaux de la présente étude ont été réalisés conformément à notre offre de services professionnelles produite le 28 novembre 2018 (N/Réf 2018-P024-0024-03) et acceptée par le Client le 11 janvier 2019 via une confirmation par mail et un retour de l'offre de services approuvée.

Selon les informations transmises par le client, la présente étude a pour but de vérifier la conformité et l'état de l'infrastructure d'un tronçon de la piste polyvalente du Canal-de-Chambly, et de formuler des recommandations afin de le rendre plus sécuritaire.

Les informations recueillies suite aux travaux sur le site nous ont permis de déterminer la nature et les propriétés des sols en place et les conditions de l'eau souterraine, ce qui nous a permis de formuler les recommandations géotechniques pertinentes pour la conception de ce projet.

Le présent rapport contient une description du site à l'étude, des méthodes de reconnaissance, une description détaillée de la nature et des propriétés des sols en place et des conditions de l'eau souterraine qui prévalent au site. Une section est consacrée à la discussion des résultats obtenus et à l'élaboration des recommandations géotechniques pertinentes au projet.

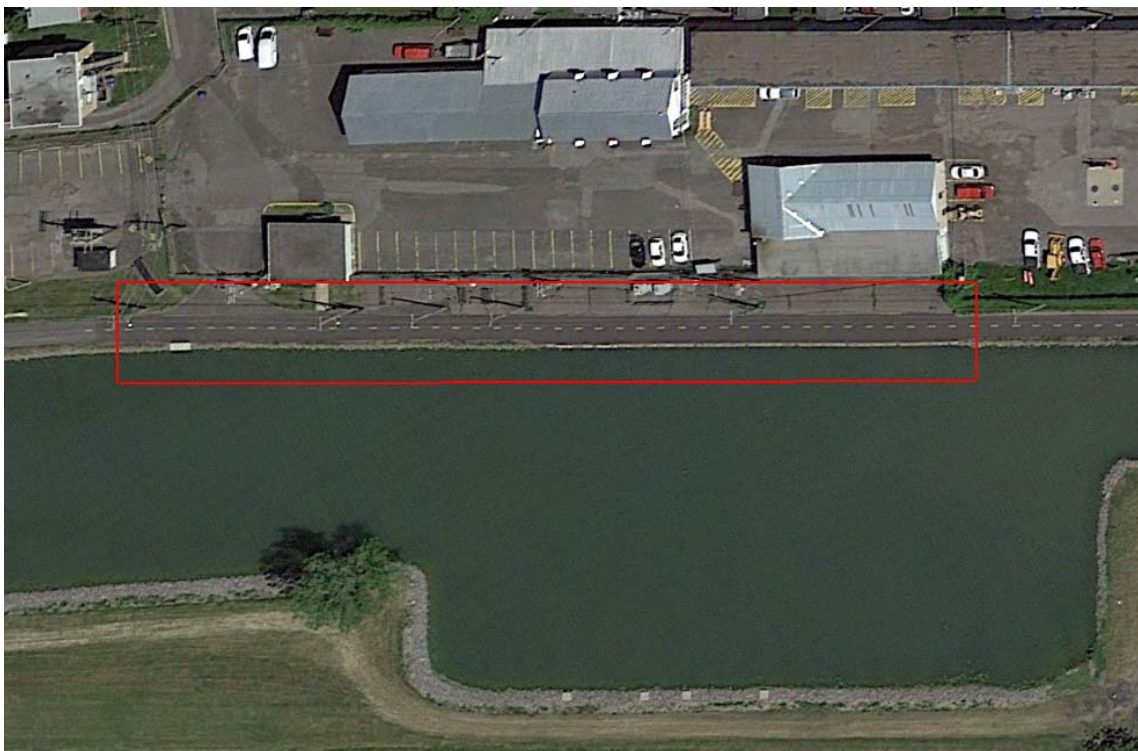
La portée et les limitations du présent rapport sont précisées à l'annexe 1. Ces commentaires s'avèrent importants pour une bonne compréhension des informations contenues dans le rapport et doivent être considérés comme faisant partie intégrante de celui-ci.

## 2 Description du site et du projet

Le site à l'étude est localisé sur un tronçon de la piste polyvalente du Canal-de-Chambly, sise sur l'avenue Bourgogne, à Chambly, province de Québec.

La figure 1 montre l'emplacement du tronçon à l'étude sur la piste, d'une longueur d'environ 125 mètres et qui correspond au secteur 03 du projet de réfection du site. Le document de l'annexe 5 montre l'aspect au sol de la piste cyclable (2014).

Figure 1 Localisation du site à l'étude (tirée de Google Earth)



La topographie du site à l'étude est relativement plane. Des fissures transversales et longitudinales ont été observées sur la structure du tronçon de la piste.

Selon les informations fournies par le client, l'étude d'Englobe s'inscrit dans le cadre du projet « Sécurité piste-L.H.N.C du canal de Chambly ». Ce projet inclut, entre autres, la reconstruction complète de la structure de chaussée de la piste cyclable au site du tronçon à l'étude.

## 3 Méthode de l'étude

Dans le cadre de cette étude, le programme de travail en chantier comportait les activités suivantes :

- ▶ La vérification des services souterrains publics avec « Info-Excavation »;
- ▶ L'implantation du forage aux emplacements définis par CIMA+ et Parc Canada en collaboration avec Englobe;
- ▶ La réalisation du forage et l'échantillonnage des sols;
- ▶ La réalisation d'un programme d'essais en laboratoire sur les échantillons prélevés sur le secteur investigué.

### 3.1 Travaux sur le site

Tous les travaux de reconnaissance sur le terrain ont été accomplis sous la supervision constante d'un membre qualifié en géotechnique du personnel technique d'Englobe. Les travaux de forage se sont déroulés le 26 février 2019.

Initialement, notre mandat consistait en la réalisation de deux forages identifiés TF-01-19 et TF-02-19, profonds de 3,50 m. Toutefois, le forage TF-01-19 n'a pas pu être réalisé à cause de son positionnement en dessous des câbles électriques. Le client a dû l'annuler.

Le rapport détaillé du forage réalisé est présenté à l'annexe 2 du présent document tandis que sa localisation est montrée au dessin 025-B-0020632-1-GE-D-0001-00 de l'annexe 4.

#### 3.1.1 Localisation, implantation et nivellement des sondages

Le forage TF-02-19 a été localisé à l'endroit le plus représentatif et libre de services d'utilités publiques et privées sur le tronçon de la piste.

L'emplacement du forage est donné en référence aux coordonnées (latitude, longitude) relevées à l'aide d'un GPS de poche. Suivant la réalisation du forage, la position et l'élévation finale de celui-ci ont été relevées par la firme d'arpentage Services Topo, mandaté par Englobe. La localisation ainsi que l'élévation du forage sont présentées au plan de localisation et profil stratigraphique identifié 025-B-0020632-1-GE-D-0001-00 de l'annexe 4.

#### 3.1.2 Forage

Le forage TF-02-19 a été réalisé à l'aide d'une foreuse hydraulique conventionnelle de type « CME 55 » montée sur camion de la compagnie Forage André Roy Inc. et a été avancé au moyen de tarières évidées et de tubages.

Les matériaux ont été échantillonnés en continu à l'aide d'un carottier fendu de 65 mm de diamètre intérieur (calibre N) enfoncé dans le sol par battage avec un bélier de 63,5 kg tombant d'une hauteur de 760 mm. Ce procédé permet en même temps de mesurer l'indice de pénétration standard, valeur N, exprimé par le nombre de coups nécessaires pour enfoncer le carottier de 300 mm dans le sol, le tout suivant la procédure normalisée ASTM D1586 (SPT).



Afin de mesurer et de suivre, au besoin, le niveau de l'eau souterraine dans les sols, un tube d'observation en PVC d'environ 20 mm de diamètre muni d'une section crépinée de mêmes diamètres et matériaux a été installé dans le forage.

L'espace annulaire entre le tubage de PVC et les parois du forage a été comblé par un sable de silice au niveau de la crépine, suivi d'un bouchon de bentonite et de matériaux tout-venants (remblai). Le sable de silice utilisé comme massif filtrant a été prolongé au-dessus de la crépine, soit jusqu'au bouchon de bentonite. Le tube d'observation a été terminé en surface par une boîte de service en aluminium de 15 cm de diamètre installée à égalité du sol.

Toutes les informations recueillies lors de l'exécution du forage ont été consignées sur le rapport de forage présenté à l'annexe 2.

## 3.2 Programme d'essais et analyses en laboratoire

### 3.2.1 Essais géotechniques

Tous les échantillons de sols prélevés dans le forage ont été transportés à notre laboratoire de géotechnique pour les besoins d'analyses, d'identification et de classification. Ils ont tous fait l'objet d'un examen visuel attentif de la part d'un ingénieur.

Des échantillons de sol prélevés à différentes profondeurs ont été soumis à des essais de laboratoire afin de compléter les informations recueillies lors des travaux de chantier quant à leurs caractéristiques géotechniques. Ces essais ont été réalisés selon les exigences des normes BNQ applicables et les résultats sont présentés à l'annexe 3.

Le tableau 1 présente le programme d'essais en laboratoire réalisé.

Tableau 1 Programme des essais en laboratoire

Type d'essai	Norme	Nombre d'essais réalisés
Analyse granulométrique par tamisage et lavage	LC 21-040	1
Limites de consistance (d'Atterberg)	NQ 2501-092	2
Teneur en eau	NQ 2501-170	2

## 4 Présentation des résultats

### 4.1 Nature et propriétés des matériaux

Les paragraphes qui suivent présentent un résumé des différents matériaux mis en évidence sur site et sur la base des informations recueillies lors des travaux de forage et en laboratoire. La position et la description des matériaux identifiés au droit du forage sont présentées sur le rapport de forage de l'annexe 2. Les résultats détaillés des analyses effectuées en laboratoire sont présentés, quant à eux, à l'annexe 3.

Tableau 2 Résumé des matériaux interceptés au droit des forages

Forage no	Enrobé bitumineux et dalle de béton	Fondation granulaire prof. (m)	Remblai prof. (m)	Profondeur (m)	
				Sol naturel Dépôt d'argile silteuse	Fin du forage
TF-02-19	0,00 – 0,15	0,15 – 0,61	0,61 – 1,83	1,83 → 3,05	3,05

Une description sommaire de chacune de ces unités stratigraphiques est donnée dans les sous-sections suivantes.

#### 4.1.1.1 Revêtement en place

Le sondage TF-02-19 a été effectué dans la section du tronçon de la piste cyclable à l'étude qui est localisée vis-à-vis le quai de béton. À cet endroit, le revêtement, d'une épaisseur totale de 150 mm, est constitué par les matériaux suivants :

- ▶ Enrobés bitumineux d'une épaisseur de 70 mm. Cette épaisseur inclut le resurfaçage effectué durant l'année 2017.
- ▶ Dalle de béton d'une épaisseur de 90 mm.

Il est possible que le revêtement de la piste cyclable, à l'extérieur de la section vis à vis le quai de béton (mur de gabions), n'inclut pas de dalle de béton. La réalisation de carottages du revêtement pourrait préciser ce paramètre.

#### 4.1.1.2 Fondation granulaire

Directement en dessous de l'enrobé bitumineux, une couche de fondation granulaire a été interceptée sur une épaisseur 460 mm. Les matériaux de la fondation granulaire sont constitués, de façon générale, de pierre concassée et de sable contenant un peu ou des traces de silt, de couleur grise, et s'apparentant à un matériau concassé de calibre 0-20 mm.

Une analyse granulométrique par tamisage et lavage a été réalisée en laboratoire sur un échantillon prélevé dans cette couche. Cet essai indique que la teneur en particules fines moyenne (passant le tamis d'ouverture 0,080 mm) de ces matériaux est élevée. Les résultats de ces analyses sont présentés au tableau 3. La teneur en particules fines de l'échantillon prélevé est élevée, soit 16 %, ce qui rend ce matériau irré récupérable pour la reconstruction de la structure de chaussée de la piste cyclable.

Tableau 3 Résultats des analyses granulométriques par tamisage – fondation granulaire

Forage n°	Prof. (m)	% passant et dimension des particules			Classement USCS
		Gravier > 5 mm	Sable < 5 mm et > 80 µm	Silt et argile < 80 µm	
TF-02-19	0,15 – 0,61	27,2	56,8	16	SM

#### 4.1.1.3 Remblai

Une couche de matériaux de remblai a été interceptée directement sous la couche de la fondation granulaire sur une épaisseur de 1,2 m.

Une limite de consistance et une teneur en eau ont été réalisées en laboratoire sur l'échantillon CF-1. Les résultats de ces analyses sont présentés au tableau 4.

Tableau 4 Résultats des limites de liquidité et de plasticité – Remblai

Forage n°	Éch. n°	Prof. (m)	W	WI	Wp	IP	IL	Classification USCS
TF-02-19	CF-1	0,61 – 0,73	38,2	48	29	19	0,5	ML

*W* : teneur en eau

*I<sub>P</sub>* : indice de plasticité

*W<sub>L</sub>* : limite de liquidité

*I<sub>L</sub>* : indice de liquidité

*W<sub>P</sub>* : limite de plasticité

Selon les données recueillies ainsi que sur la base d'observations visuelles, ces matériaux de remblai sont constitués d'un faciès cohérent, composés de silt argileux avec un mélange de sable et de gravier en proportions variables, de couleur brune.

#### 4.1.1.4 Sol naturel

Le terrain naturel a été atteint directement en dessous de la couche de remblai. Le terrain naturel correspond à une couche de sols cohérents constituée de dépôt d'argile silteuse avec traces de sable de couleur grise.

Une limite de consistance et une teneur en eau ont été réalisées en laboratoire sur l'échantillon CF-4. Les résultats de ces analyses sont présentés au tableau 5.

Tableau 5 Résultats des limites de liquidité et de plasticité – Remblai

Forage n°	Éch. n°	Prof. (m)	W	WI	Wp	IP	IL	Classification USCS
TF-02-19	CF-4	2,44 – 3,05	38,2	59	25	34	0,4	CH

*W* : teneur en eau

*I<sub>P</sub>* : indice de plasticité

*W<sub>L</sub>* : limite de liquidité

*I<sub>L</sub>* : indice de liquidité

*W<sub>P</sub>* : limite de plasticité

Selon les résultats des essais de consistance, le dépôt cohérent correspond à une argile silteuse de moyenne plasticité (classée CH selon la classification unifiée USCS).

## 5 Eau souterraine

Un tube d'observation a été installé suite au retrait des tarières du forage. Les détails d'installation de l'instrument est présenté sur le rapport de forage à l'annexe 2.

Le tableau 6 présente le niveau d'eau tel que mesuré le 22 mars 2019.

Tableau 6 Relevés du niveau d'eau mesuré dans l'instrument

Forage [élévation]	Profondeur d'eau [élévation]
TF-02-19 [16,74 m]	2,20 m [14,54 m]

\* Mesure prise directement suite à l'installation du tube d'observation.

Comme on peut le constater, la profondeur de l'eau souterraine est à 2,20 m de profondeur par rapport au niveau du sol sur la propriété, soit possiblement à une élévation près de celle du niveau de l'eau dans le canal.

Il est important de souligner que le niveau de l'eau dans les sols est cependant susceptible de fluctuer à la hausse ou à la baisse selon les modifications apportées au milieu physique, les saisons et/ou les conditions climatiques, et peut donc se retrouver à des profondeurs différentes à d'autres périodes de l'année et dans le temps. Également, étant donné le court délai entre la fin des travaux de chantier et la mesure des niveaux d'eau, il est possible que le niveau d'eau mesuré ne corresponde pas au niveau d'eau stabilisé. Afin de préciser la profondeur de l'eau souterraine, d'autres lectures seraient requises à différentes périodes.

## 7 Discussion et recommandation – Volets géotechnique et chaussée

### 7.1 Stabilité de la piste cyclable

Les images de la chaussée de la piste cyclable selon Google Streetview, datant de l'année 2014 (voir annexe 5), montrent la présence de fissures longitudinales qui peuvent être l'indication d'une instabilité du massif qui supporte la piste cyclable et un glissement latéral vers le canal. Ces images montrent cependant l'état de la surface avant la réalisation d'une intervention d'entretien effectuée durant l'année 2017 et qui a possiblement consisté en un recouvrement de la surface existante à l'aide d'une couche d'enrobés bitumineux. Sur les images de la surface durant l'année 2018 (voir annexe 5), on n'observe pas la réapparition de ces fissures mais la période de 1 an est très courte entre la réhabilitation de l'année 2017 et la prise de photographies durant l'année 2018.

Il est recommandable que la stabilité du massif (stabilité de pentes) soit vérifiée car les déplacements latéraux qui résulteraient de son éventuelle instabilité seraient la cause d'une détérioration prématurée des nouvelles surfaces construites dans le cadre du projet.

### 7.2 Structure de chaussée

Il est important de souligner que les recommandations d'ordre géotechnique traitées dans les paragraphes qui suivent concernent uniquement le tronçon de la piste cyclable défini par le forage réalisé. Les autres tronçons de la piste ne sont pas abordés dans cette étude.

Selon les informations recueillies à partir des travaux sur terrain, la surface du tronçon à l'étude au site du sondage est une dalle de béton recouverte d'enrobé bitumineux. Donc, il apparaît probable que les fissures apparentes en surface de l'enrobé bitumineux correspondent à des fissures existantes dans la dalle de béton et qui sont remontées à travers l'enrobé.

Les commentaires et recommandations présentés dans les paragraphes suivants sont basés sur les résultats des travaux sur le terrain et en laboratoire, de même que sur les informations qui nous ont été transmises par le client.

#### 7.2.1 Matériaux du sol-support

Le matériau retenu pour le dimensionnement structural et le calcul de la protection au gel requise est constitué par un silt argileux de classification ML, dont l'indice de plasticité sera plus faible que 12 et l'indice de liquidité sera plus faible que 0,9. Pour ce qui est de la dalle de béton extérieure, un matériau constitué par une argile silteuse de classification CH (profondeur de 1,8 m) a été considéré afin de réduire l'épaisseur de protection au gel requise.

#### 7.2.2 Sollicitation par les camions

Selon les informations disponibles, la sollicitation « lourde » de la piste cyclable sera limitée au passage occasionnel de véhicules d'entretien (camionnettes, balais mécaniques, déneigeuses et autres véhicules légers).

### 7.2.3 Structures de chaussée

Le dimensionnement structural des chaussées est basé sur les données relatives aux matériaux du sol-support et aux sollicitations par les véhicules lourds présentées aux chapitres précédents. Le dimensionnement structural devra être révisé advenant des modifications à ces données durant la préparation des plans et devis ou durant la construction des chaussées.

Les calculs relatifs au dimensionnement des structures de chaussée ont été effectués en conformité avec la méthodologie du guide de dimensionnement de l'American Association of State Highway and Transportation Officials (A.A.S.H.T.O.), édition 1993, pour une durée de vie structurale de 25 ans. L'épaisseur d'enrobé de 90 mm recommandée vise à réduire la formation de fissures de retrait thermique transversales dans la piste cyclable.

Les structures de chaussée proposées sont dimensionnées selon les pratiques actuelles de façon à assurer la protection partielle au gel applicable du sol-support et un bon comportement en période hivernale de la chaussée. La protection au gel du sol-support qui est recommandable pour une chaussée souple dans la région de Chambly est de l'ordre de 890 mm, en considérant un sol-support constitué par un remblai de silt argileux avec un mélange de sable et de gravier en proportions variables. Pour ce qui est de la fondation granulaire de la dalle de béton extérieure, un soulèvement différentiel de 38 mm est généralement visé pour prévenir la fissuration de la dalle. Afin de réduire l'épaisseur de protection au gel qui serait ainsi requise, soit 1,95 m sur un matériau ML, nous recommandons de construire la fondation granulaire de la dalle de béton sur le sol naturel de type CH identifié à une profondeur de 1,8 m.

L'utilisation de cadres et couvercles de type ajustable permettra de minimiser la formation de fissures autour des regards et puisards, si requis, qui pourraient résulter d'un soulèvement non uniforme de la chaussée dont la protection au gel est partielle.

Les tableaux 7 et 8 présentent les structures de chaussée recommandées pour la piste cyclable, qui peut également être applicables pour les surfaces en pavés de béton, ainsi que pour la nouvelle aire bétonnée (dalle de béton extérieure).

Le tableau 7 résume la structure de chaussée recommandée pour la piste cyclable.

Tableau 7 Structure de chaussée proposée -piste cyclable

Éléments de la structure de chaussée	Type de matériau	Épaisseur (mm)	Compactage (%)
Revêtement bitumineux <sup>1</sup>	EC-10 bitume PG 58S-28	30	93-98 % (LC 26-040/045)
	ESG-10 Bitume 58S-28	60	
Fondation	Pierre concassée MG 20	300	95 % min. (NQ 2501-255)
Sous-fondation <sup>3</sup>	MG 112 <sup>2</sup>	500	95 % min. (NQ 2501-255)
<b>Total :</b>		<b>890</b>	

Note 1 : Un liant d'accrochage devra être appliqué entre chaque couche d'enrobé à un taux résiduel de 0,20 l/m<sup>2</sup>. La période retenue pour la pose des enrobés doit respecter les exigences de l'article 13.3.4 du CCDG

Note 2 : Les matériaux granulaires de type MG 112 peuvent être remplacés, selon les disponibilités, par des matériaux granulaires de type MG 56 ou MG 80, neufs ou recyclés (recyclés de type MR-1 à MR-5, selon la norme NQ 2560-600). Les matériaux granulaires de type MG 112 doivent contenir de 20 à 75 % de particules passant au tamis de 5 mm. Le matériau de sous-fondation peut être une pierre concassée, un gravier concassé ou un gravier naturel.

Note 3 : Si les matériaux de sous-fondation utilisés ne respectent pas le critère de filtre pour couche anticontaminante selon la norme NQ 2560-114, il faudra alors poser, au préalable, une membrane géotextile de type III, selon la norme 13101 du Tome VII – Matériaux du MTQ, et ce, entre les matériaux d'infrastructure et ceux de sous-fondation. La membrane géotextile peut également être remplacée par la mise en place d'une couche anticontaminante selon la norme NQ 2560-114 sur une épaisseur supplémentaire minimale de 100 mm afin de limiter la migration des particules fines vers les matériaux de sous-fondation sus-jacents dont l'épaisseur demeure inchangée.

Note générale : La mise en place de têtes de regards et puisards de type auto-nivelant est recommandée dans tous les cas.

Cette structure de chaussée assure une durée de vie structurale calculée de 25 ans, si les différentes couches de matériaux sont mises en place selon les méthodes décrites dans les sections suivantes.

L'utilisation de cadres et couvercles de type auto-ajustable est recommandable, le cas échéant, car elle permet de minimiser la formation de fissures autour des regards et puisards qui pourraient résulter d'un soulèvement uniforme de la chaussée dont la protection au gel est partielle.

Le tableau 8 résume la structure de chaussée recommandée pour la nouvelle aire bétonnée (dalle de béton extérieure)

Tableau 8 Structure de chaussée proposée -dalle de béton extérieure

Éléments de la structure de chaussée	Type de matériau	Épaisseur (mm)	Compactage (%)
Dalle de béton	Béton de ciment, résistance en flexion minimale de 5 MPa	À définir <sup>1</sup>	93-98 % (LC 26-040/045)
Fondation	Pierre concassée MG 20	300	95 % min. (NQ 2501-255)
Sous-fondation <sup>3</sup>	MG 112 <sup>2</sup>	Approx. 1,4 m <sup>1</sup>	95 % min. (NQ 2501-255)
<b>Total :</b>		<b>1,8 m</b>	

Note 1 : Aucun calcul structural effectué par Englobe. Épaisseur de la sous-fondation à définir en fonction de l'épaisseur de la dalle de béton.

Note 2 : Les matériaux granulaires de type MG 112 peuvent être remplacés, selon les disponibilités, par des matériaux granulaires de type MG 56 ou MG 80, neufs ou recyclés (recyclés de type MR-1 à MR-5, selon la norme NQ 2560-600). Les matériaux granulaires de type MG 112 doivent contenir de 20 à 75 % de particules passant au tamis de 5 mm. Le matériau de sous-fondation peut être une pierre concassée, un gravier concassé ou un gravier naturel.

Note 3 : Si les matériaux de sous-fondation utilisés ne respectent pas le critère de filtre pour couche anticontaminante selon la norme NQ 2560-114, il faudra alors poser, au préalable, une membrane géotextile de type III, selon la norme 13101 du Tome VII – Matériaux du MTQ, et ce, entre les matériaux d'infrastructure et ceux de sous-fondation. La membrane géotextile peut également être remplacée par la mise en place d'une couche anticontaminante selon la norme NQ 2560-114 sur une épaisseur supplémentaire minimale de 100 mm afin de limiter la migration des particules fines vers les matériaux de sous-fondation sus-jacents dont l'épaisseur demeure inchangée.

Note générale : La mise en place de têtes de regards et puisards de type auto-nivelant est recommandée dans tous les cas.

## 7.2.4 Préparation de l'infrastructure

Afin de préparer l'infrastructure, nous émettons les recommandations suivantes :

- ▶ Excaver tous les matériaux de l'infrastructure notamment, la couche d'enrobé bitumineux, la dalle de béton, la pierre concassée et une partie la couche de remblai cohérent. Les excavations doivent être effectuées à l'aide d'une pelle mécanique munie d'un godet sans dents (godet à fossé) pour éviter le remaniement des matériaux argileux. On évitera aussi d'effectuer les travaux pendant les périodes de pluie.
- ▶ La préparation de la surface de l'infrastructure s'effectuera selon les indications applicables de l'article 11.9 du CCDG du MTQ.
- ▶ De façon plus spécifique et afin de minimiser les déformations et la fissuration prématurée de la surface pavée, il est recommandé de profiler adéquatement la surface du sol-support (infrastructure) de façon à obtenir les pentes requises et dans le but de permettre l'écoulement des eaux d'infiltration vers des drains permanents et efficaces.
- ▶ Le drainage permanent de la surface du sol-support et des matériaux de la structure de chaussée peut être assuré par des drains de rive en périphérie, par des ouvertures dans les fûts des puisards, ou autre technique permettant d'évacuer efficacement l'eau qui pourrait s'infiltrer dans la fondation granulaire de la chaussée. La surface du sol-support doit être exempte de tout matériau remanié et de toute déformation de la surface causés par le passage des équipements de construction sur la plateforme, et ce, préalablement à la mise en place des matériaux de la structure de chaussée.
- ▶ Afin de protéger les sols fins et de favoriser le drainage, il est recommandé de placer un géotextile à la surface de l'infrastructure. Le géotextile doit avoir une épaisseur d'au moins



5 mm et un coefficient de perméabilité supérieur à  $10^{-5}$  m s<sup>-1</sup>. Il s'agit d'un géotextile type III suivant la norme 13101 du MTQ. Une fois le géotextile installé, on peut procéder à la mise en place de la sous-fondation.

## 7.3 Recommandations relatives aux matériaux de chaussée

Les matériaux discutés dans ce chapitre sont ceux visés par les normes contenues dans le Tome VII – Matériaux de la collection « Normes – Ouvrages routiers », le recueil des méthodes d'essai du Laboratoire des chaussées du MTQ, la norme NQ 2560-114 du BNQ. De façon plus spécifique, ils doivent rencontrer les exigences spécifiées aux sections suivantes.

### 7.3.1 Bitume pour enrobés

Pour la structure de la piste cyclable, la présente étude recommande l'utilisation d'un bitume de performance PG 58S-28 pour la fabrication de l'enrobé bitumineux.

Les bitumes devront satisfaire les exigences du tableau 4101-1 de la norme 4101 du Tome VII – Matériaux de la collection « Normes – Ouvrages routiers » du MTQ. Il est fortement recommandé d'effectuer des essais en laboratoire, sur des échantillons représentatifs du bitume, afin d'en vérifier la conformité avec les exigences de la norme précitée.

### 7.3.2 Granulats pour enrobés bitumineux

Les granulats utilisés pour la fabrication des enrobés bitumineux doivent satisfaire les exigences granulométriques formulées aux normes 2101 et 4201 et 4202 du Tome VII – Matériaux de la collection « Normes – Ouvrages routiers » du MTQ, mais également les exigences décrites au tableau 9.

Tableau 9 Caractéristiques intrinsèques et de fabrication (Norme 2101 du Tome VII – Matériaux du MTQ)

Usage	Type d'enrobé	Gros granulats <sup>1,2</sup>		Granulats fins <sup>1,2</sup>
		Caractéristiques intrinsèques	Caractéristiques de fabrication	Caractéristiques intrinsèques
Couche de surface	EG-10	4	C	2

1 Les valeurs indiquées dans le tableau concernant les caractéristiques des gros granulats et granulats fins correspondent aux données indiquées dans les tableaux 2101-2, 2101-3 et 2101-4 tirés de la norme 2101, applicable aux ouvrages routiers du MTQ.

2 Aucun granulats recyclé ne doit être utilisé pour la fabrication des enrobés.

La période retenue pour la pose des enrobés doit respecter les exigences de l'article 13.3.4 du CCDG

### 7.3.3 Granulats pour fondation et sous-fondation (emprunt)

Les matériaux constituant les éléments de la chaussée devront être mis en place en couches d'une épaisseur maximale de 300 mm, compactés jusqu'au degré de compactage décrit au tableau 8.

Les granulats devront satisfaire les exigences formulées dans la norme NQ 2560-114 du BNQ, concernant les fuseaux granulométriques des granulats, les caractéristiques intrinsèques, de fabrication et complémentaires des gros granulats et des granulats fins ainsi que les exigences formulées dans le tableau 10.

L'utilisation de matériaux recyclés contenant des résidus d'enrobé bitumineux et de béton de ciment est permise en fondation supérieure (MG 20). Pour une utilisation en tant que matériaux de fondation supérieure, les matériaux recyclés doivent être de type MR-1 à MR-2 et respecter les exigences de la norme NQ 2560-600.

Tableau 10 Caractéristiques mécaniques et physiques des granulats de fondation et de sous-fondation (emprunt)

Essai	Norme d'essai	Exigences	
		MG 20	MG 56
Micro-Deval (M.D.)	LC-21-070	35 % max.	35 % max.
Los Angeles (L.A.)	LC-21-400	50 % max.	50 % max.
M.D. + L.A.	---	80 % max.	80 % max.
Fragmentation	LC-21-100	50 % min.	50 % min.
Matières organiques <sup>(1)</sup>	LC-31-228	0,8 % max.	0,8 % max.
Valeur en bleu <sup>(1)</sup>	LC-21-255	0,20 max.	0,20 max.
Indice C.B.R.	ASTM D-1883	100 min.	100 min.
Proportion de résidus d'enrobés bitumineux (norme NQ 2560-600)	LC-21-901	15 % max. (MR-1 ou MR-2)	Non applicable

<sup>(1)</sup> Ces essais sont requis pour les granulats provenant des gravières et sablières uniquement.

La mise en place d'une couche de criblure de pierre, immédiatement sous le revêtement bitumineux, est à proscrire. La proportion élevée de particules fines généralement contenues dans ce matériau, de même que sa portance inférieure à la pierre concassée, réduisent la durée de vie des chaussées de façon significative.



## **Annexe 1    Portée et limitation de l'étude**



## PORTÉE DE L'ÉTUDE GÉOTECHNIQUE

### 1.0 *Caractéristiques des sols et du roc*

Les caractéristiques des sols et du roc décrites dans ce rapport proviennent de forages et/ou de sondages effectués à une période donnée et correspondent à la nature du terrain aux seuls endroits où ces mêmes forages et sondages ont été effectués. Ces caractéristiques peuvent varier de façon importante entre les points de forage et de sondage.

Les formations de sol et de roc présentent une variabilité naturelle. Les limites entre les différentes formations présentées sur les rapports doivent donc être considérées comme des transitions entre les formations plutôt que comme des frontières fixes. La précision de ces limites dépend du type et du nombre de sondages, de la méthode de sondage, de la fréquence et de la méthode d'échantillonnage.

Les descriptions des échantillons prélevés ont été faites selon les méthodes d'identification et de classification reconnues et utilisées en géotechnique. Elles peuvent impliquer le recours au jugement et à l'interprétation du personnel ayant réalisé l'examen des matériaux. Celles-ci peuvent être présumées justes et correctes suivant la pratique courante dans le domaine de la géotechnique. Finalement, si des essais ont été effectués, les résultats de ces essais ne sont valides que pour l'échantillon décrit dans le présent rapport.

Les propriétés des sols et du roc peuvent être modifiées de façon importante à la suite d'activités de construction, telles que l'excavation, le dynamitage, le battage de pieux ou le drainage, effectuées sur le site ou sur un site adjacent. Elles peuvent également être modifiées indirectement par l'exposition des sols ou du roc au gel ou aux intempéries.

### 2.0 *Eau souterraine*

Les conditions d'eau souterraine présentées dans ce rapport s'appliquent uniquement au site étudié. La précision et la représentation de ces conditions doivent être interprétées en fonction du type d'instrumentation mis en place et de la période, de la durée et du nombre d'observations effectuées. Ces conditions peuvent varier selon les précipitations, les saisons et éventuellement les marées. Elles peuvent également varier à la suite d'activités de construction ou de modifications d'éléments physiques sur le site ou dans le voisinage. La problématique de l'ocre ferreuse et ses effets n'est pas couverte par le présent rapport.

### 3.0 *Utilisation du rapport*

Les commentaires et recommandations donnés dans ce rapport s'adressent principalement à l'équipe de conception du projet. Pour déterminer toutes les conditions souterraines pouvant affecter les coûts et les techniques de construction, le choix des équipements ainsi que la planification des opérations, le nombre de forages ou de sondages nécessaire pourrait être supérieur au nombre de forages ou sondages effectué pour les besoins de la conception. Les entrepreneurs présentant une soumission ou effectuant les travaux doivent effectuer leur propre interprétation des résultats des forages et des sondages et au besoin leur propre investigation pour déterminer comment les conditions en place peuvent influencer leurs travaux ou leur méthode de travail.

Toute modification de la conception, de la position et de l'élévation des ouvrages devra être communiquée rapidement à Englobe de façon à ce que la validité des recommandations présentées puisse être vérifiée. Des travaux complémentaires de terrain ou de laboratoire pourraient éventuellement s'avérer nécessaires.

Le rapport ne doit pas être reproduit, sinon entier, sans l'autorisation de Englobe.

### 4.0 *Suivi du projet*

L'interprétation des résultats de chantier et de laboratoire et les recommandations présentées dans ce rapport s'appliquent uniquement au site étudié et aux informations disponibles sur le projet au moment de la rédaction du rapport.

Les informations disponibles sur les conditions de terrain et sur l'eau souterraine augmentent au fur et à mesure de l'avancement des travaux de construction. Les conditions de terrain ayant été interprétées et corrélées entre les points de forage et de sondage, Englobe devrait avoir la possibilité de vérifier ces conditions de terrain par des visites de chantier effectuées au fur et à mesure de l'avancement des travaux, afin de confirmer les informations obtenues des forages et sondages. S'il nous est impossible de faire de telles vérifications, Englobe n'assurera aucune responsabilité concernant l'interprétation géotechnique que des tiers feront des recommandations de ce rapport, particulièrement si la conception est modifiée ou que des conditions de terrain différentes à celles décrites dans ce rapport sont rencontrées. L'identification de tels changements requiert de l'expérience et doit être effectuée par un ingénieur géotechnicien expérimenté.

### 5.0 *Environnement*

Les informations contenues dans ce rapport ne couvrent pas les aspects environnementaux des conditions de terrain, ces aspects ne faisant pas partie du mandat d'étude.



## **Annexe 2 Note explicative et rapport de forage**





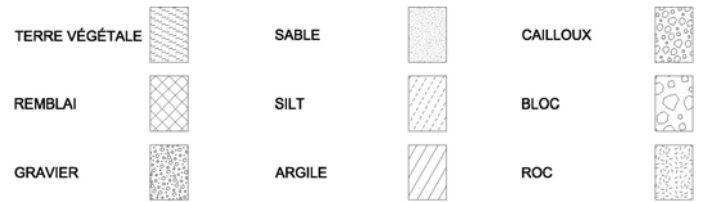
Les rapports de sondage qui font suite à cette note synthétisent les données de chantier et de laboratoire sur les propriétés géotechniques des sols, de la roche et de l'eau souterraine recueillies à chaque sondage. Cette note a pour but d'expliquer les différents symboles et abréviations utilisés dans les rapports de sondage.

### STRATIGRAPHIE

**Élévation/Profondeur :** Dans cette colonne sont inscrites les élévations des contacts géologiques rattachées au niveau de référence mentionné à l'en-tête du rapport de sondage et établies à partir de la surface du terrain mesuré au moment de la réalisation du sondage. Les profondeurs sont également indiquées.

**Description des sols et du roc :** Chaque formation géologique est décrite selon la terminologie d'usage présentée ci-dessous.

### SYMBOLES



### NIVEAU D'EAU

Dans cette colonne est indiquée l'élévation du niveau de l'eau souterraine mesurée à la date indiquée. Un schéma présentant le type et la profondeur d'installation est aussi présenté dans cette colonne.

### ÉCHANTILLONS

**Type et numéro :** Chaque échantillon est étiqueté conformément au numéro de cette colonne et la notation donnée réfère au type d'échantillon décrit à l'en-tête du rapport de sondage.

**Sous-échantillon :** Lorsqu'un échantillon inclut un changement de matière stratigraphique, il est parfois requis de le séparer et de créer des sous-échantillons. Cette colonne permet l'identification de ces derniers et permet l'association des mesures in situ et en laboratoire à ces sous-échantillons.

**État :** La position, la longueur et l'état de chaque échantillon sont montrés dans cette colonne. Le symbole illustre l'état de l'échantillon suivant la légende donnée à l'en-tête du rapport de sondage.

**Calibre :** Dans cette colonne est indiqué le calibre de l'échantillonneur.

**N et Nb coups/150 mm :** L'indice de pénétration standard « N » donné dans cette section est montré dans la colonne correspondante. Cet indice est obtenu de l'essai de pénétration standard et correspond au nombre de coups d'un marteau de 63,5 kilogrammes tombant en chute libre de 0,76 mètre nécessaire pour enfoncer les 300 derniers millimètres du carottier fendu normalisé (ASTM D-1586). Le résultat du nombre de coups obtenu par 150 mm est indiqué dans la colonne Nb coups/150 mm. Pour un carottier de 610 mm de longueur, l'indice N est obtenu en additionnant le nombre de coups nécessaire pour enfoncer les 2<sup>e</sup> et 3<sup>e</sup> courses de 150 mm d'enfoncement.

**RQD :** L'indice de qualité de la roche (RQD) est défini comme étant le rapport de la longueur totale de tous les fragments de carottes de 100 millimètres ou plus à la longueur totale de la course. L'indice RQD est présenté en pourcentage.

### ESSAIS

**Résultats :** Dans cette section, les résultats d'essais effectués sur le chantier et au laboratoire sont indiqués à la profondeur correspondante. La définition des symboles rattachés à chaque essai est présentée à l'en-tête du rapport de sondage. Les résultats des essais qui n'apparaissent pas sur le rapport sont présentés en note à la fin du rapport de sondage. Par contre, une abréviation indiquant le type d'analyse réalisée est présentée vis-à-vis l'échantillon analysé.

**Graphique :** Ce graphique montre la résistance au cisaillement non drainé des sols cohérents mesurée en chantier ou en laboratoire (NQ 2501-200). Il est également utilisé pour les essais de pénétration dynamique (NQ 2501-145). De plus, ce graphique sert à la représentation des résultats de la teneur en eau et des limites d'Atterberg.

#### Classification

Argile  
Silt et argile (non différenciés)  
Sable  
Gravier  
Caillou  
Bloc

#### Dimension des particules

Plus petite que 0,002 mm  
plus petite que 0,08 mm  
de 0,08 à 5 mm  
de 5 à 80 mm  
de 80 à 300 mm  
plus grande que 300 mm

#### Terminologie descriptive

« Traces »  
« Un peu »  
Adjectif (ex. : sableux, silteux)  
« Et » (ex. : sable et gravier)

#### Proportions

1 à 10 %  
10 à 20 %  
20 à 35 %  
35 à 50 %

#### Compacité des sols granulaires

Très lâche  
Lâche  
Moyenne ou compacte  
Dense  
Très dense

#### Indice « N » de l'essai de pénétration standard, ASTM D-1586 (coups par 300 mm de pénétration)

0 à 4  
4 à 10  
10 à 30  
30 à 50  
plus de 50

#### Consistance des sols cohérents

Très molle  
Molle  
Moyenne ou ferme  
Raide  
Très raide  
Dure

#### Résistance au cisaillement non drainé (kPa)

Moins de 12  
12 à 25  
25 à 50  
50 à 100  
100 à 200  
plus de 200

#### Plasticité des sols cohérents

Faible  
Moyenne  
Élevée

#### Limite de liquidité

Inférieure à 30 %  
entre 30 et 50 %  
supérieure à 50 %

#### Sensibilité des sols cohérents

Faible  
Moyenne  
Forte  
Très forte  
Argile sensible

#### S<sub>t</sub>=(Cu/Cur)

S<sub>t</sub> < 2  
2 à 4  
4 à 8  
8 à 16  
S<sub>t</sub> > 16

#### Classification du roc

Très mauvaise qualité  
Mauvaise qualité  
Qualité moyenne  
Bonne qualité  
Excellente qualité

#### RQD (%)

< 25  
25 à 50  
50 à 75  
75 à 90  
90 à 100



Projet: **Réhabilitation d'un tronçons de la piste polyvalente du canal de Chambly**

 Endroit: **Chambly, Qc**

Coordonnées (m): Nord 5033984,9 (Y)

**MTM NAD 83 FUS 8** Est 322087,0 (X)

 Élévation **16,74 (Z)**

Prof. du roc: m Prof. de fin: 3,05 m

**État des échantillons**

Intact Remanié Perdu Carotte

**Examens organoleptiques sur les sols:**

 Aspect visuel: Inexistant(I); Disséminé(D); Imbibé(IM)  
 Odeur: Inexistante(I); Légère(L); Moyenne(M); Persistante(P)

**Type d'échantillon**

**CF** Carottier fendu  
**TM** Tube à paroi mince  
**PS** Tube à piston fixe  
**CR** Tube carottier  
**TA** À la tarière  
**MA** À la main  
**TU** Tube transparent  
**PW** Carottier Englobe  
**SG** Sol gelé

**Abréviations**

**L** Limites de consistance  
**W<sub>L</sub>** Limite de liquidité (%)  
**W<sub>P</sub>** Limite de plasticité (%)  
**I<sub>p</sub>** Indice de plasticité (%)  
**I<sub>L</sub>** Indice de liquidité  
**W** Teneur en eau (%)  
**AG** Analyse granulométrique  
**S** Sédimentométrie  
**R** Refus à l'enfoncement  
**PDT** Poids des tiges  
**PDM** Poids du marteau  
**M.O.** Matière organique (%)  
**K** Perméabilité (cm/s)  
**PV** Poids volumique (kN/m<sup>3</sup>)  
**A** Absorption (l/min. m)  
**U** Compression uniaxiale (MPa)  
**RQD** Indice de qualité du roc (%)  
**AC** Analyse chimique  
**P<sub>L</sub>** Pression limite, essai pressiométrique (kPa)  
**E<sub>M</sub>** Module pressiométrique (MPa)  
**E<sub>r</sub>** Module de réaction du roc (MPa)  
**SP<sub>o</sub>** Potentiel de ségrégation (mm<sup>2</sup>/H °C)

Niveau d'eau  
**N** Pénétration standard (Nb coups/300mm)  
**N<sub>C</sub>** Pénétration dyn. (Nb coups/300mm) ●  
**σ'<sub>p</sub>** Pression de préconsolidation (kPa)  
**TAS** Taux d'agressivité des sols

**Résistance au cisaillement**

**C<sub>U</sub>** Intact (kPa)  
**C<sub>UR</sub>** Remanié (kPa)

Chantier   
 Laboratoire

DDM

Échelle verticale = 1 : 33

EQ-09-Ge-66 R.1 04.03.2009

**STRATIGRAPHIE**
**ÉCHANTILLONS**
**ESSAIS**

PROFONDEUR - pi	PROFONDEUR - m	ÉLÉVATION - m	PROF. - m	DESCRIPTION DES SOLS ET DU ROC	SYMBLES	NIVEAU D'EAU (m) / DATE	TYPE ET NUMÉRO	SOUS-ÉCH.	ÉTAT	CALIBRE	RÉCUPÉRATION %	Nb coups/150mm	"N" ou RQD	Examens organo.		RÉSULTATS	TENEUR EN EAU ET LIMITES (%)	
														Odeur	Visuel		W <sub>p</sub>	W <sub>L</sub>
		16,74	0,00	Enrobé bitumineux.														
		16,67	0,07	Dalle de béton.														
		16,59	0,15	Fondation granulaire : pierre concassée de de calibre apparent 0-20mm.														
		16,13	0,61	Remblai : silt argileux, un peu de sable, brun.			MA-1	CF-01		N	100	50				AG		
		15,52	1,22	Devenant graveleux.				CF-02		N	34	4-8 7-19	15					
		14,91	1,83	Sol naturel : argile silteuse, traces de sable, gris, de consistance apparente ferme.				CF-03		N	2	2-3 4-5	7					
		13,69	3,05	Fin du forage à une profondeur de 3,05m.				CF-04		N	89	2-3 4-6	7					

Remarques:

 Type de forage: **Tarière évidée**

 Équipement de forage: **CME 55**

 Préparé par: **M.-O. Gouin, B.Sc.**

 Vérifié par: **J. Beket-Dalce, ing. jr**

2019-03-25

Page: 1 de 1



## **Annexe 3 Résultats des essais de laboratoire**



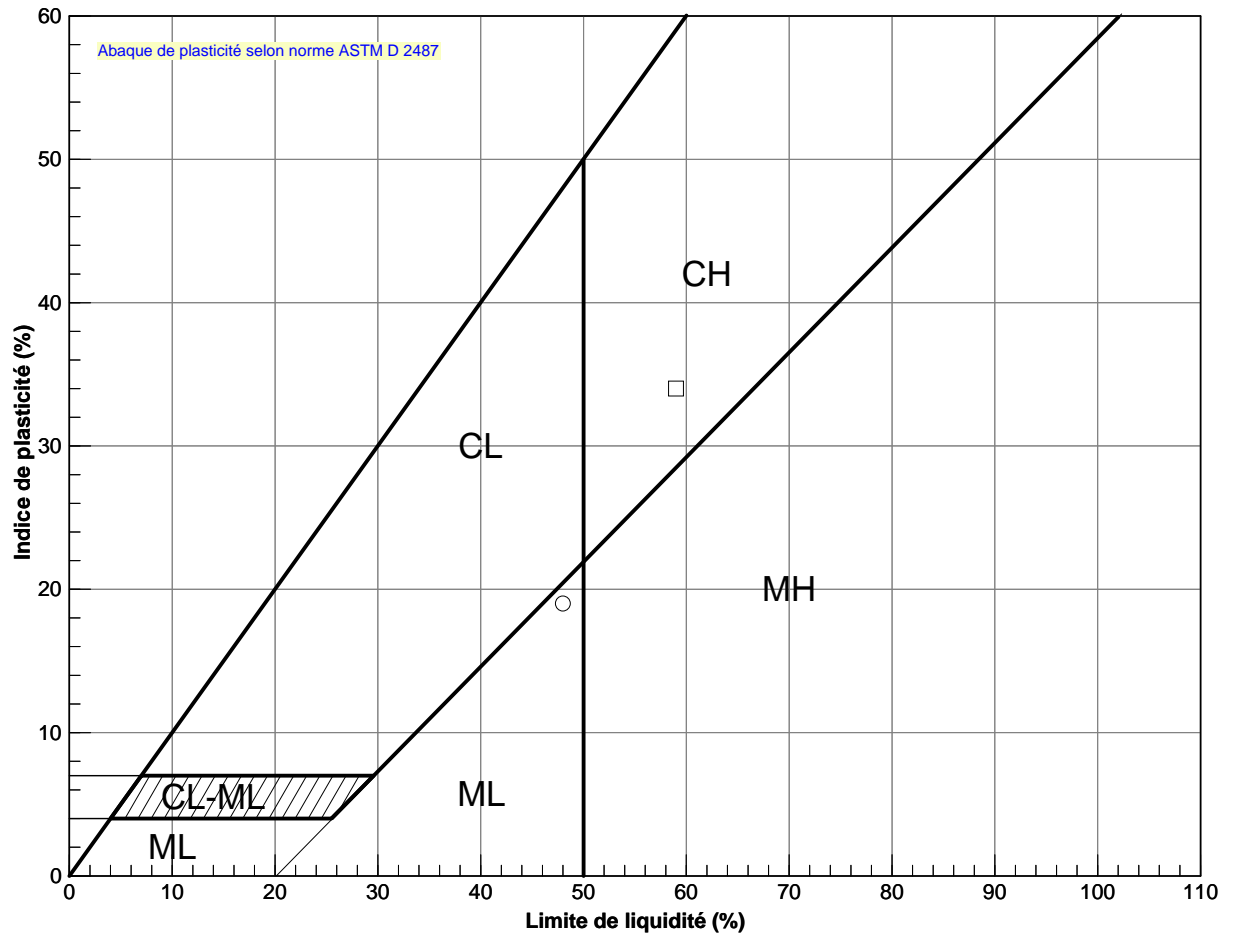




Projet : **Réhabilitation d'un tronçons de la piste polyvalente du canal de Chambly**

 Figure n° : **2**

 Endroit : **Chambly, Qc**

 Dossier n° : **B-0020632-1**


Symbole	Sondage n°	Échantillon n°	Profondeur (m)	W <sub>N</sub>	W <sub>L</sub>	W <sub>P</sub>	I <sub>P</sub>	I <sub>L</sub>	Class. USCS
○	TF-02-19	CF-01	0.61 - 0.74	38,2	48,0	29,0	19	0,5	ML
□	TF-02-19	CF-04	2.44 - 3.05	38,2	59,0	25,0	34	0,4	CH

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EQ-09-Ge-68 R.1 04.03.2009

## **Annexe 4 Plan de localisation du forage**



COORDONNÉES DES FORAGES-NAD83 MTM, FUSEAU 8			
SONDAGE	Nord (Y)	Est (X)	ÉLÉVATION
TF-02-19	5 033 984,9	322 087,0	16,74



Ce document doit être utilisé conjointement avec les recommandations formulées dans le rapport d'étude géotechnique

**LÉGENDE :**

**TF-NN-AA**  
00.00 FORAGE-NUMÉRO-ANNÉE  
ÉLÉVATION (m)



1:1 000

**NOTES :**  
L'IMAGE EN FOND DE PLAN PROVIENT DE LA BIBLIOTHÈQUE  
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Projet  
**RÉHABILITATION D'UN TRONÇONS DE LA PISTE  
POLYVALENTE DU CANAL DE CHAMBLY**

Chambly, Qc

Titre  
**LOCALISATION DU FORAGE**



**Englobe Corp.**

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Discipline : <b>Géotechnique</b>	Préparé par : H. Armouzi, ing. jr	Vérfié par : L. Chartrand, ing.
Échelle : <b>1:1 000</b>	Dessiné par : D. De Miguel, dess.	Approuvé par :
Date : 04/03/2019	No. de la figure :	
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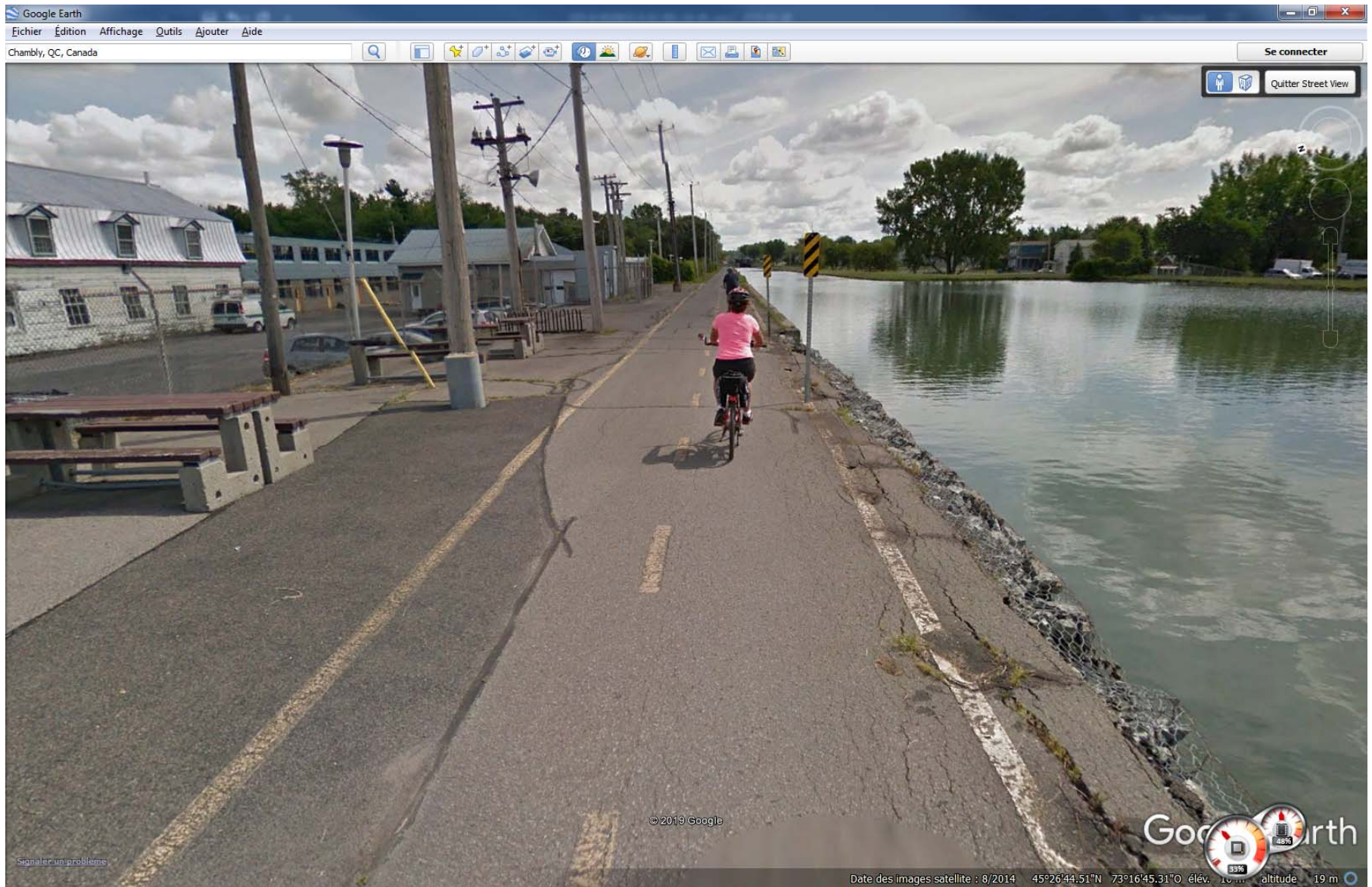
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## Annexe 5 État de la surface



Vue 2014





Vue 2018



