

PARKS CANADA AGENCY

**Major rehabilitation of route 132 in Forillon National
Park- Phase II**

N/Réf. client : PRO-000212

TECHNICAL SPECIFICATIONS ISSUED FOR TENDER

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PARKS CANADA

Major rehabilitation of Route 132 in Forillon National Park- Phase II

TECHNICAL SPECIFICATIONS CIVIL

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END OF SECTION

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Section A Technical Specifications

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 All Sections included in this Specification.

1.2 SCHEDULE OF WORK

- .1 Works must be carried out from Monday to Friday between 06:00 and 18:00. Work may be permitted upon request two (2) weeks in advance, during some weekends depending on the reasons and request justifications.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The work covered by this contract and concerning the construction of a new road and bridge, over the Cap-des-Rosiers creek along section II (2) of route 132 in Forillon National Park, includes without being limited to:
 - .1 Construction of a new road between the stations indicated on the plans, which includes the load and the transport of the cut wood, excavation, backfill, preparation of the excavated surfaces, ditches, granular foundations, road surface, shoulders and asphalt surface;
 - .2 Removal and disposal of existing guardrails and the furniture and upgrading of flexible guardrails;
 - .3 Furnish and install security guardrails;
 - .4 Pavement marking;
 - .5 Removal and reinstallation of the existing vertical signage;
 - .6 Furnish and install new signage;
 - .7 Removal and disposal of the existing culverts;
 - .8 Furnish and construct new culverts;
 - .9 Excavations required for the works;
 - .10 The backfilling of excavations and compaction conforming to details on plans;
 - .11 Construction of a new bridge;
 - .12 Cleaning existing ditches, if required;
 - .13 Reshaping of existing ditches, if required;
 - .14 Stone protections including geotextile;
 - .15 Reconfiguration and alterations to the bridge approaches;
 - .16 Pavement of the bridge approaches;
 - .17 All resurfacing;

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- .18 Environmental measures for work streams;
- .19 Cleaning and maintenance of the road during construction;
- .20 Health and Safety of the site during the works;

1.4 SCHEDULING

- .1 In the following five (5) after the awarding of the contract, submit to the ministerial representative the shop drawings of the steel beams shown in the plans of work of engineering (bridge).
- .2 At the kick-off meeting of the project, submit to the Ministerial Representative the work development site plan for approval.
 - .1 In the following five (5) days of delivery of facility development site plan, the Ministerial Representative shall provide the Contractor a revised copy thereof, together with comments, if any.
 - .2 Within five (5) days following the acceptance of facility development site plan, the Contractor shall complete the implementation of the construction trailers.
- .3 At the kick-off meeting, submit to the Ministerial Representative the schedule of major rehabilitation of Route 132 in Forillon National Park, Phase II. The schedule must take into consideration the following elements, without being limited to:
 - .1 The restricted work period within high water limits over a period of two (2) years as defined in section 01 35 43- Environmental Protection;
 - .2 The work schedule for earthworks and civil engineering works (excluding the civil engineering works of the bridge itself) is limited to a 20 week calendar period;
 - .3 The work schedule for construction of the Monumental Works (Bridge) is limited to a 22 week calendar period in 2015 and a 2 week calendar period in 2016 in the eventuality that the temperature is opposite to complete the following:
 - .1 Waterproofing membranes on the bridge.
 - .2 Permanent pavement on the bridge.
 - .3 Installation and furnishing turf and vegetation of the abutment shoulders.
- .4 Should the Contractor be unable to complete the works within the specified periods, the Ministerial Representative shall determine the number of days of delay required to partially or completely terminate the works. The Contractor shall be held responsible for damages due to delays in the execution of the works and shall pay the Owner/Applicable Public Authority, where applicable, liquidated and non-liquidated damages as a penalty:

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- .1 A sum of 1 500\$ per day for each calendar day of delay for Civil Engineering and Earthworks.
- .2 A sum of 1 500\$ per day for each calendar day of delay for the construction of the Monumental Works (bridge).
- .3 The sums shall be cumulative.
- .4 The specified period shall begin as of the date indicated on the Notice to Proceed.

1.5 WORK EXECUTION

- .1 By accepting this agreement, assume all the responsibilities normally assigned to the project supervisor party, according to health and safety law. Before starting the work, proceed with the following activities:
 - .1 Provide the Ministerial Representative with a safety work plan and a mechanical inspection certificate for each piece of machinery used on site.
 - .2 Ensure that workers on the site received training and information necessary in order to work safely and that all tools and protective equipment required are available, compliant with the standards, laws and regulations.
 - .3 Comply at all times with the provisions of the health and safety Act and the Safety Code for the construction.
 - .4 Inform your employees of their right to refuse work that is dangerous to their health or safety.
 - .5 In the case of non-foreseen incidents take all necessary steps, including stopping work, to protect the health and safety of workers and the public, and immediately contact the Ministerial Representative.

1.6 CONTRACTOR USE OF PREMISES

- .1 The operational seasons of Forillon National Park are:
 - .1 Spring intermediate season: from first weekend of June to the end of the Fête de la St-Jean-Baptiste (National Holiday) weekend;
 - .2 High season: from Fête de la St-Jean-Baptiste (National Holiday) weekend to Labor Day weekend;
 - .3 Fall intermediate season: from Labor Day weekend to Thanksgiving Holiday weekend.
- .2 The use of the premises is restricted to necessary areas for the execution of the work and access shall be given to allow occupation by the Owner/Applicable Public Authority;

- .3 Coordinate the use of the premises as directed by the Ministerial Representative and foresee a place where the Contractor may establish its trailer / site installations;
- .4 Once the deforestation is completed, no additional deforestation will be permitted without written authorisation from the Ministerial Representative. The Contractor shall limit deforestation as possible, and adapt its working methods and machinery in this sense, all as directed by the Ministerial Representative. It should be noted that the clearing (deforestation) was beforehand made, on the other hand, the wood resulting from the cutting was left on-the-spot.
- .5 The Contractor must take into account, in their work methods, that trench widths must be limited and secure temporary shoring methods be used.
- .6 The Contractor shall store its equipment, supplies and materials within the land included in the work area in accordance with applicable regulations (demarcation, signage, access, margin and security clearance, etc.) in order to always allow at least one alternating traffic lane. In high season, parking areas and daytime areas of Forillon National Park cannot be used by the Contractor except for those specified in section 01 52 00. Outside the high season, parts of parking areas or daytime areas may be used upon request two (2) weeks in advance and with justifications. Areas used, if any, shall be fenced and signage posted. The Contractor shall be responsible for documenting the state of the premises before work and remediating the premises to their pre-work state after their use.
- .7 The Contractor shall obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .8 The Contractor shall foresee, in their work methods, the limiting of trench openings, provision of safe temporary retaining walls and maintenance of traffic circulation for the construction of culverts and the road rehabilitation.
- .9 Once work is completed, existing installations and conditions must be in a state that is equal to or better than those that existed before work commenced.
- .10 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by the Ministerial Representative.

1.7 OWNER/APPLICABLE PUBLIC AUTHORITY OCCUPANCY

- .1 Owner/ Applicable Public Authority will occupy premises during entire construction period and pursue normal operations.
- .2 Co-operate with Owner/Applicable Public Authority in scheduling operations to minimize conflict and to facilitate Owner usage.

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1.8 EXISTING SERVICES

- .1 The Contractor shall protect and support existing public utilities, cables, underground concrete structures, electric and telephone poles. The Contractor shall be liable for breach of existing structures and will replace at its own costs.
- .2 Provide alternative routes for personnel and vehicular traffic in order that the public use of services be maintained and protected.
- .3 Establish location and extent of public utilities in work area before commencing works. Notify the Ministerial Representative.
- .4 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .5 Where unknown services are encountered, immediately advise the Ministerial Representative and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

1.9 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings;
 - .2 Specifications;
 - .3 Addenda;
 - .4 Reviewed shop drawings;
 - .5 List of outstanding shop drawings;
 - .6 Change orders;
 - .7 Other modifications to contract;
 - .8 Field test reports;
 - .9 Copy of approved work schedule;
 - .10 Health and safety plan and other safety related documents;
 - .11 Other documents as specified.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 32 18 – Schedule Work bar Chart

1.2 PRICE AND TERMS OF PAYMENT

- .1 The costs of project meetings should be included in the bid price for each item concerned on the bid form.

1.3 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work, every two (2) weeks.
- .2 The Ministerial Representative prepares agenda for meetings.
- .3 The Ministerial Representative distributes written notice of each meeting at least four (4) days in advance of meeting date to the Contractor, the Ministerial Representative and the Consultant.
- .4 Provide physical space and make arrangements for meetings.
- .5 The Ministerial Representative presides at meetings.
- .6 The Ministerial Representative records the meeting minutes. He includes significant proceedings and decisions. He identifies actions by parties.
- .7 Reproduce and distribute copies of minutes within five (5) days after meetings and transmits such minutes to meeting participants and affected parties not in attendance.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of the party each represents.

1.4 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, the Ministerial Representative requests a kick-off meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 The Ministerial Representative, the Consultant and the Contractor and his Subcontractors will be in attendance.
- .3 The Ministerial Representative establishes time and location of meeting and notifies parties concerned minimum five (5) days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

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- .5 Agenda of kick-off meeting to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work.
 - .3 Schedule of submission of shop drawings, samples, colour chips in accordance with 01 33 00 - Submittal Procedures section.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with 01 52 00 - Construction Facilities section.
 - .5 Delivery schedule of specified equipment, materials.
 - .6 Site security in accordance with 01 56 00 - Temporary Barriers and Enclosures section.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .8 Owner/Applicable Public Authority provided products.
 - .9 Record drawings in accordance with 01 33 00 - Submittal Procedures section.
 - .10 Take-over procedures, acceptance, warranties.
 - .11 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .12 Appointment of inspection and testing agencies or firms.
 - .13 Insurances, transcript of policies.

1.5 PROGRESS MEETINGS

- .1 The Ministerial Representative establishes a schedule of meetings to be held every two (2) weeks during course of the work until the completion thereof.
- .2 Contractor, major Subcontractors involved in work and Ministerial Representative(s) are to be in attendance.
- .3 The Ministerial Representative notifies parties minimum five (5) days prior to meetings.
- .4 The Ministerial Representative records minutes of meetings and transmits such minutes to attending parties and affected parties not in attendance within five (5) days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.

- .4 Health and safety.
- .5 Problems which impede work schedule.
- .6 Review of off-site fabrication delivery schedules.
- .7 Corrective measures and procedures to regain projected schedule.
- .8 Revision to work schedule.
- .9 Progress schedule, during succeeding work period.
- .10 Review submittal schedules of submittal procedures: acceleration of the process if needed.
- .11 Maintenance of quality standards.
- .12 Review proposed changes and their potential impact on the schedule and on completion date.
- .13 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

Partie 1 General

1.1 PRECEDENCE

- .1 In the case of work carried out for the federal Government, the Division 1 sections take precedence over the technical sections of the other divisions of the project specifications.

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 Charts should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 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 Milestone: significant event in project, usually completion of major deliverable.
- .7 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.

1.3 REQUIREMENTS

- .1 Ensure Detailed Schedule is practical and remains within specified Contract duration.

- .2 Plan to complete Work in accordance with prescribed milestones and time frame. The Project Schedule must take into account: work restriction periods due to high water position, timeframes and deadlines specified in Section 01 11 00 – Summary of Work.
- .3 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 in this contract.

1.4 SUBMITTALS

- .1 Submit to Departmental Representative two implementation schedules no later than 5 calendar days after notification of the contract. The first Project Schedule relates to planned construction work for the bridge and the second Project Schedule is for road construction work. The implementation schedule will be used for planning and monitoring work, and for the production of progress reports.

1.5 MASTER PLAN

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

1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes minimum milestone and activity types as follows: non-exhaustive list:
 - .1 Contract award
 - .2 Shop drawings, samples
 - .3 Permits
 - .4 Mobilization
 - .5 Topographic survey
 - .6 Excavation, stockpile materials to reuse and removal and disposal of existing materials

- .7 Construction of abutment cofferdams
- .8 Construction of concrete support layers for excavation bottoms of abutment footings
- .9 Abutment footing formwork
- .10 Installation of abutment footing reinforcement
- .11 Concreting of abutment footings
- .12 Form removal of abutment footings
- .13 Abutment front wall formwork up to construction joints, as shown on plans
- .14 Installation of abutment front wall reinforcement up to construction joints, as shown on plans
- .15 Concreting of lower end of front walls up to construction joint
- .16 Form removal for lower end of front walls
- .17 Dismantling of cofferdams
- .18 Backfilling of lower end of embankment and slope protection
- .19 Formwork for remaining abutment sections
- .20 Installation of reinforcement for remaining abutment sections
- .21 Concreting of remaining abutment sections
- .22 Form removal for remaining abutment sections
- .23 Backfilling of higher end of abutments and slope protection
- .24 Granular support layer for approach slab
- .25 Installation of approach slab reinforcement
- .26 Concreting of approach slabs
- .27 Construction of pedestals and installation of bearings
- .28 Erection of steel girders and diaphragms
- .29 Deck slab formwork
- .30 Installation of deck reinforcement
- .31 Preparation and installation of cold weather deck protection
- .32 Concreting of deck
- .33 Deck form removal
- .34 Formwork and concreting of curbs
- .35 Form removal of curbs
- .36 Installation of deck joint mobile support and formwork of remaining sections
- .37 Installation of guardrails on deck and return walls
- .38 Installation of concrete border at approach
- .39 Installation of guardrails and rigidity transitions at approaches

- .40 Installation of temporary paving on deck
 - .41 Removal of temporary paving on deck
 - .42 Installation of waterproofing membrane on deck
 - .43 Installation of permanent paving on deck
 - .44 Sodding
- .3 The detailed Project Schedule for the construction of the road must include the following steps: non-exhaustive list:
- .1 Contract award
 - .2 Shop drawings, samples
 - .3 Permits
 - .4 Mobilization
 - .5 Topographic survey
 - .6 Excavation, stockpile materials to reuse and removal and disposal of existing materials
 - .7 Installation of culverts and other materials
 - .8 Backfill
 - .9 Infrastructure preparation
 - .10 Installation of road foundation according to various layers
 - .11 Installation of pavement
 - .12 Installation of guardrails and end devices
 - .13 Installation of Forillon National Park signage and small signage
 - .14 Earthwork and riprap protection
 - .15 Surfaces repairs
 - .16 Correction of deficiencies
- 1.7 PROJECT SCHEDULE REPORTING**
- .1 Update Project Schedule every two (2) weeks reflecting activity changes and completions, as well as activities in progress.
- 1.8 PROJECT MEETINGS**
- .1 See Section 01 31 19 – Project Meetings.

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 Section 01 11 00 – Summary of Work
- .2 Section 01 70 12 – Safety Requirements
- .3 Section 01 35 43 – Environmental Procedures
- .4 Section 02 81 01 – Hazardous Materials
- .5 All other applicable sections of the specification requiring the submission of documents.

1.2 ADMINISTRATIVE

- .1 Submit to the Ministerial 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 the Ministerial 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 the Ministerial Representative, in writing at time of submission, identifying alterations with regards to the requirements of Contract Documents and stating reasons for such alterations.
- .7 Verify that field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by the Ministerial Representative review of submittals.

- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the Ministerial 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 shop drawings bearing stamp and signature of qualified professional engineer in good standing of the *Ordre des Ingénieurs du Québec*.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow seven (7) days for the Ministerial Representative review of each submission.
- .5 Adjustments made on shop drawings by the Ministerial Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Ministerial Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as the Ministerial Representative may require, consistent with Contract Documents. When resubmitting, notify the Ministerial 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 Materials and details of 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 the Ministerial Representative review is completed, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification sections and as the Ministerial Representative may reasonably request.
- .11 Submit electronic copy of test reports for requirements requested in specification sections and as requested by the Ministerial 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 three (3) years of date of contract award for project.
- .12 Submit electronic copy of certificates for requirements requested in specification sections and as requested by the Ministerial Representative.
 - .1 Documents, printed on paper of official correspondence of the manufacturer and signed by authorized official of the latter, must certify that the products, materials, equipment and systems be provided meet the requirements of the specifications.

- .2 The certificates must be dated after the award of the Contract and indicate the name of the project.
- .13 Delete information not applicable to project.
- .14 Supplement standard information to provide details applicable to project.
- .15 If upon review by the Ministerial Representative, no errors or omissions are discovered or if only minor corrections are made, 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.
- .16 The review of shop drawings by the Ministerial Representative is for the sole purpose of ascertaining conformance with the general concepts.
 - .1 This review shall not signify that Parks Canada Agency 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.
 - .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 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit documents required by the *Commission de la Santé et de la sécurité au Travail* (Workers Safety Board).
- .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

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 10 – Summary of Work
- .2 Section 01 29 00 – Payment Procedures

1.2 REFERENCES

- .1 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux – Construction et réparation (CCDG)*
 - .2 *Normes – Ouvrages routiers du ministère des Transports (Volumes I through VIII)*
 - .3 Any reference to these documents refers to the most current edition at the time of publication of the call for tenders.

1.3 GENERAL

- .1 These specifications supplement the *Cahier des charges et devis généraux – Construction et réparation (CCDG)* and the MTQ's *Normes – Ouvrages routiers collections (Volumes I through VIII)*. Any reference to these documents refers to the most current edition at the time of publication of the call for tenders.
- .2 The stipulations concerning traffic control and signage apply to all the works subject to the contract.
- .3 The Contractor should note that the table entitled "*Échéances à respecter pour la mise aux normes des dispositifs de signalisation*" from Volume V – *Signalisation routière* does not apply to this contract. The Contractor shall respect the signage standards in force on the publication date of the call for tenders.

1.4 PLANS AND SKETCHES

- .1 Signage plans provided by Contractor
 - .1 The Contractor must provide the Departmental Representative with a copy of the signage plans along with a work plan explaining any additional traffic control measures it intends to implement, at least 5 days before installing the signage.
 - .2 In the event the deadline for submitting the signage plans and sketches is not met, the Department reserves the right not to give the go-ahead for the work. The cost of this report will then be at the expense of the Contractor.

- .3 The signage plans must be signed and sealed by a member of the Ordre des Ingénieurs du Québec (OIQ).
- .4 The Contractor must use standardized drawings for long-term works.
- .5 The Contractor must take the safety of workers and users into account, particularly in terms of respecting visibility distances, installation distances according to longitudinal gradients and existing road obstructions and, if necessary, adding signage devices.
- .6 The plans must indicate the chosen signage and restraining devices, their exact location, their set-up and any other relevant details as well as the management of the permanent signage. They must be adapted to the actual conditions of the area.

1.5 TEMPORARY SPEED LIMITS AND "SPEED LIMIT" SIGNS

- .1 The legal temporary speed limit must be set based on the actual conditions of the work zone and the speed zoning guidelines provided in the standards.
- .2 The "Speed Limit" signs (T-70-1) and, if necessary, the "Advanced Speed Limit Warning Sign" (T-70-2) must display a speed of 50 km/h.

1.6 PRESENCE OF AN OBSTACLE AND SIDE CLEARANCE

- .1 An obstacle is a fixed object, an excavation, or any other obstruction.
- .2 The side clearance zone is a safety distance perpendicular to the traffic lane from the edge line. This zone must be free of obstructions.
- .3 The Contractor shall identify fixed objects within the side clearance zone in order to protect them.
- .4 The highest displayed legal speed limit must be used in the work zone, when it is not the same for the entire length of the site. The Contractor shall use the following table to determine the side clearance zone.

| Displayed speed limit [km/h] | Side clearance [m] |
|------------------------------|--------------------|
| 100 | 9.0 |
| 90 | 7.5 |
| 80 | 6.0 |
| 70 | 5.0 |
| 50 and less | 3.0 |

1.7 PROTECTION OF PUBLIC TRAFFIC

- .1 Comply with laws, regulations and orders regarding traffic and the use of the roads on which work is to be performed or material or equipment transported.
- .2 No traffic lane shall be closed without written authorization from the Departmental Representative.

1.8 INFORMATION AND WARNING DEVICES

- .1 Temporary traffic lights for works
 - .1 On stretches of road with a speed limit above 80 km/h, the Contractor shall provide advanced warning with the "Advanced Traffic Light Warning" (T-D-50-1) sign.
- .2 Advanced warning on approaches to construction sites
 - .1 In addition to the advanced warning requirements in Volume V – *Signalisation routière*, the Contractor must provide advanced warning as follows:
 - .1 Advance warning 1 km in advance; according to Volume V – *Signalisation routière* from the MTQ's *Normes – Ouvrages routiers* collection;
- .3 Departmental Representative: Maintain all signage devices as follows:
 - .1 Verify signals daily to ensure they are legible, in good repair, properly placed and that they meet requirements. Clean, repair or, if necessary, replace the signals, to maintain brightness and reflectance.
 - .2 Remove or cover signals which do not apply to current situations, as these situations may change from one day to the next.

1.9 PUBLIC TRAFFIC CONTROL

- .1 When a two-way road must be reduced to one lane, traffic will be directed one lane at a time, the Contractor must choose working methods to limit users' wait times to ten minutes maximum, including driving time. If this maximum delay is exceeded, the Contractor shall modify his working methods. If it neglects to correct the situation, the Supervisor or the Supervisor's representative will stop the works. The owner will not be charged for any expenses related to this stoppage.
- .2 During periods when the road is completely open, traffic lanes and the shoulders shall remain free from all obstructions during the work.
- .3 The Contractor shall begin the site or change phases during off-peak hours, unless it obtains permission from the Departmental Representative.

- .4 Moreover, when the nature of the work allows, the Contractor must vacate the site or reduce obstructions to a minimum before Friday afternoon rush hour. Also, the Contractor shall limit obstructions during long weekends and the construction holidays as a function of summer traffic.
- .5 *Traffic lane closing requests*
 - .1 To carry out work which requires closing one or more traffic lanes, a written request shall be sent to the Department no later than seven days before the work begins.

1.10 SIGNAGE OFFICER

- .1 The signage officer shall have a working cell phone, with voice mail, at all times. The telephone number must remain the same for the duration of the contract.
- .2 The signage officer must be available at all times (24/7). He must respond to requests from the Supervisor within one hour.
- .3 At the start of each phase, the signage officer and the Supervisor must carry out an inspection of the signage.
- .4 When the Supervisor identifies a non-conformity during his daily inspection, he will notify the signage officer. The signage officer will make the adjustments requested by the Supervisor within one hour.
- .5 All work will be carried out to the satisfaction of the Departmental Representative and this work will be at the Contractor's expense.
- .6 The results of all inspections must be recorded in writing, using the "Signage Inspection Form" V-3224
- .7 The signage officer must be present on the site during installation and dismantling for each signage phase.
- .8 The signage officer must fill out the Speed Limit Management System (V-3046-B 2013-03) work site log book which he will receive at the first site meeting (or ensure the document is filled out and countersign it daily). He must indicate the date and time of the installation, covering, uncovering and removal, location ("chaînage" and side of the road) and the speed limit indicated on all the maximum speed limit signs (P-70-2 and T-70-1) and the "END" signs (T-40) that he installs and removes. Moreover, he must record the hours during which the maximum speed limit signs will be covered and the hours during which they will be in operation. Any changes to the location of each sign must also be recorded in the work site log book. Every day after signing the log book, he gives it to the Supervisor.
- .9 Communication

- .1 The Contractor must ensure that reliable telephone communication is available at all times.
- .10 Emergency
 - .1 Emergency Situation
 - .1 In the event of an emergency, the Contractor must immediately contact:
 - .1 the Supervisor;
 - .2 the PCA representative during office hours.

1.11 RESTRICTIONS

- .1 Maintain existing traffic conditions for duration of project. However, when justified by the construction work carried out under the terms of this contract, and provided that, in compliance with these specifications, measures approved by the Departmental Representative have been taken to protect and regulate public traffic, these conditions may be modified as follows:
 - .1 Cap-Des-Rosiers Boulevard
 - .1 Cap-Des-Rosiers Boulevard located between the existing Road 132 and the coastline must be closed to traffic for the entire duration of the work. The Contractor must plan for the necessary signage on Road 132 as well as on Cap-Des-Rosiers Boulevard while the road is closed.
 - .2 The Contractor may not use (drive) the section of Cap-Des-Rosiers Boulevard along the coastline. This road will also be closed to visitor traffic, but OPEN to PEDESTRIANS.
 - .2 North Sector Road
 - .1 The North Sector road will be maintained for the entire duration of the work.
 - .2 Road maintenance for the North Sector road will be assumed by the Contractor while the work is being carried out. Provisional quantities of asphalt have been provided for this purpose and may be used upon approval from the Departmental Representative.

Partie 2 Products

2.1 Signage devices

- .1 The signage devices must be in new condition when they are installed and maintained in new condition for the duration of the work. They must be cleaned on a regular basis and stored so as to maintain their required

- reflectivity. The devices must comply with standards in order to be readily seen and understood by drivers.
- .2 All of the traffic signs on the site and approaches to the site as well as detour signs on the roads must be installed on steel posts. The signs that are 1,222 mm and over in width must be installed on at least 2 posts.
 - .3 All signage posts must meet the following requirements:
 - .1 Minimum sign size 900 mm X 900 mm

Partie 3 Execution

3.1 APPLICATION

- .1 At the start of each new phase or every time changes are made to the signage, the Contractor must obtain written permission from the Supervisor in order to begin the work.

3.2 SIGNAGE DEVICES

- .1 At all times, site signage must correspond to the work being carried out, to the configuration of the area and to the requirements of the road users driving near the sites.
- .2 *General*
 - .1 The Contractor shall obtain permission from the Supervisor before installing signage on the site. The Supervisor may authorize the Contractor to install signage on steel posts provided for in the plans one week before the work begins. The signs must be covered as soon as they are installed.
 - .2 The Contractor is responsible for maintenance of the signage devices on the site. If these devices are damaged during the work, they must be repaired at the Contractor's expense within the time limit set by the Supervisor. This time limit may not exceed 24 h.
- .3 *Signage devices*
 - .1 Before planting the posts, the Contractor must carry out all necessary verifications to ensure that no public utility will be damaged.
 - .2 Existing road signage
 - .1 The Contractor shall, for the duration of the contract, cover or uncover, move, temporarily remove or adjust road signage on the site, on the approaches to the site and off the site if it is in contradiction with the temporary signage or site configuration.

- .2 Signage that has been removed shall be carefully recovered and stored at the Forillon National Park operations centre. Any damaged signage will be replaced at the Contractor's expense.

3.3 RESTRAINING DEVICES

- .1 *Guardrails*
 - .1 In addition to the requirements of the CCDG, guardrails shall be installed as stipulated in Chapter 5 "*Dispositifs de retenue pour chantier*" from Volume VIII – *Dispositifs de retenue* and as per the manufacturer's recommendations.
 - .2 At the beginning of the work and after each move, the signage officer shall confirm in writing that guardrails, connecting devices, end devices, tapered ends and round buffer ends that are not part of the end device as well as inertial barriers fixed to the ends have been installed in accordance with the manufacturer's instructions and the requirements of the contractual documents.
 - .3 Sections of guardrails that are damaged during installation or broken afterwards must be repaired or replaced by the Contractor, at the latter's expense, within the time limit set by the Supervisor (this time limit shall not exceed 24 hours).

3.4 PRESENCE OF AN OBSTACLE AND SIDE CLEARANCE

- .1 The Contractor shall carry out the work so as to secure any obstacle within the side clearance zone along the traffic lanes used by road users during the work period.
- .2 In particular, parking and storing equipment, tools and material in the side clearance zone outside of working hours (evenings, nights, weekends and holidays) is prohibited, unless these are protected by a guardrail.

3.5 CYCLIST AND PEDESTRIAN TRAFFIC

- .1 The Contractor shall maintain the lane reserved for cyclists and pedestrians and take all necessary measures to ensure their safety.

3.6 EMPLOYEES ASSIGNED TO TRAFFIC CONTROL AND SIGNALLING

- .1 When a person assigned to traffic control and signalling is replaced, or a new worker arrives on the site, the Contractor shall provide a certificate showing the worker has successfully completed the required training. All employees shall wear equipment that complies with standards.
- .2 Signallers
 - .1 The Contractor shall ensure that the employees assigned to traffic control are posted in a safe location. The signaller shall never be

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assigned any other tasks besides traffic control. In addition, the Contractor shall ensure that signals given to users are accurate and in compliance for directing traffic.

- .2 The Contractor shall ensure reliable, clear and precise communication between signallers. When the site configuration or conditions change during the work, the presence of the signallers must be re-evaluated and, if possible, they must be replaced by other methods for directing traffic (for example: traffic lights, automated signaller or an escort vehicle).

3.7 GATHERING AND STORING SIGNALLING EQUIPMENT ON THE SITE

- .1 The Contractor shall gather visual components, signs and posts within 4 days following a change of phase or the end of the work.
- .2 The Contractor shall store all non-operational signage to free up the side of the road. The Contractor shall provide, if needed, a storage area for surplus signage. This area must be previously approved by the Supervisor.

3.8 MAINTENANCE

- .1 The Contractor shall rehabilitate the site it has used or must use, take apart, break, contour or move to carry out the work, at his own expense.
- .2 The Contractor shall keep the site free from dust and spray it with water as needed or upon the request of the Supervisor. The Contractor shall also ensure the cleanliness of the roads used by the trucks. It must keep a tanker truck on hand at all times for spraying.
- .3 If the Contractor fails to comply with this clause, the Supervisor may, after issuing a 24-hour warning, have another contractor perform the cleaning and/or spraying and deduct the fees from the breakdown of the expenditures incurred.
- .4 The cost of water spraying and street cleaning with a mechanical street sweeper must be included in the tender since no specific remuneration will be allocated for these activities.
- .5 The Contractor is responsible for maintaining the traffic lanes used by road users for the duration of the work. More specifically, it is the Contractor's responsibility to:
 - .1 Patch holes over 25 mm in depth on traffic lanes and shoulders immediately after take-over of the site and for the duration of the work;
 - .2 Remove waste;
 - .3 Ensure proper drainage of driving surfaces;
 - .4 Perform the necessary work to maintain traffic flow.

- .6 The Contractor has 12 h to perform the maintenance work. This time limit begins immediately upon reception of written notification from the Supervisor.
- .7 These requirements apply to the zones with signage preceding the work areas (2 km), the work zone and any road platform serving as a detour road as well as the actual detour road, even on the municipal network.
- .8 *Maintenance and supervision team*
 - .1 The Contractor shall provide a maintenance and supervision team. This team will perform verifications and maintenance of site signage and safety devices for the duration of the traffic lane obstructions.
 - .2 In addition, this team shall periodically check the signage and traffic lane maintenance on weekends and holidays.
 - .1 At 7 a.m. and 5 p.m. every day
 - .3 Any anomaly must be reported to the Departmental Representative and corrected with one hour.

Partie 4 Holdbacks

4.1 SIGNAGE DEVICES

- .1 Non compliant signage devices
 - .1 When the Supervisor notices signage that does not comply with the plans and is not mentioned in the signage Supervisor's inspection report, a special permanent deduction of \$500 is applied to the payment form as liquidated damages and interest.
 - .2 Failure to comply with requirements for road signage regulations, requirements in Volume V – *Signalisation routière*, and specific requirements of these specifications automatically leads to a permanent deduction to cover damages and interest.
 - .3 The deduction is \$200 per day, per non-compliant or improperly located device, per improperly located sign, per sign that is uncovered and uncorrected within the specified time limit following a notification by the Supervisor. The same rule applies to each signage device that is unauthorized, poorly maintained, dirty, or whose retroreflection does not meet requirements.
 - .4 In the case of inconsistent signage that compromises user safety, the deduction is \$500 for each non-compliance warning issued by the Supervisor or his representative.
 - .5 Failure to comply with traffic light requirements will be subject to a permanent deduction of \$1,000 for each proven violation to cover damages and interest.

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4.2 SITE ACCESS

- .1 Failure by the Contractor to comply with requirements for site access will be subject to a permanent deduction of \$1,000 to cover damages and interests for each violation proven by the Departmental Representative.

4.3 OBSTRUCTION, UNAUTHORIZED CLOSURE AND LATE OPENING

- .1 Any obstruction, unauthorized closure or late opening of a traffic lane that is inconsistent with the conditions of these specifications or working hour restrictions, involves a permanent deduction to the contract of \$1,000 to cover damages and interests for each 15-minute period of the infraction. These deductions shall be fully applicable immediately upon observing the violation.

4.4 SIGNAGE OFFICER

- .1 If the requirements pertaining to the signage officer are complied with, a permanent deduction to cover damages and interest will be applied for the following violations:

| | |
|--|---------------------|
| Absence of signage officer | \$500 per violation |
| Failure to comply with time limits to reach the signage officer | \$500 per violation |
| Failure to comply with a procedure time limit | \$500 per violation |
| Inspection report not submitted to the Supervisor within the allotted time limit | \$500 per violation |

- .2 In case of emergency, if the signage Supervisor cannot be reached within the 15-minute time limit or if the situation cannot be resolved within the 1-hour allotted time limit, a Departmental Representative will contact the specialized company of his choice to intervene and remedy the situation. The Contractor shall be responsible for the cost of the work.
- .3 In addition to the provisions in the paragraph above, the Departmental Representative may, without notice, send a team to install the necessary signage to remain on site until the Contractor corrects the situation. In this case a permanent deduction to cover damages and interest of \$2,000 is applied each time the Departmental Representative intervenes.

4.5 GATHERING AND STORING SIGNALLING EQUIPMENT ON SITE

- .1 Failure by the Contractor to gather up the signage within the allotted time limit will lead to a permanent deduction of \$500 per day to cover damages and interest.

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4.6 MAINTENANCE

- .1 Traffic lane maintenance
 - .1 Failure by the Contractor to maintain traffic lanes to the Supervisor's satisfaction and within the allotted time limit will lead to a permanent deduction of \$200 per day to cover damages and interest.
- .2 Maintenance and supervision team
 - .1 In the absence of a maintenance and supervision, a permanent deduction of \$200 will be applied for each hour of absence to cover damages and interest.

END OF SECTION



Inspection de signalisation

Inspection préliminaire, de démarrage Inspection quotidienne

| | | |
|-----------------------|------------------------|--------------|
| Numéro de dossier | Numéro de projet | Entrepreneur |
| Heure de l'inspection | Localisation (entrave) | Surveillant |

| Type de travaux | |
|-----------------|--|
| 1 | <input type="checkbox"/> Démarrage initial <input type="checkbox"/> Courte durée < 24 heures <input type="checkbox"/> Changement de phase <input type="checkbox"/> Longue durée > 24 heures |

| PVM | c | nc | na |
|-----|--------------------------|--------------------------|--------------------------|
| 2 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Panneaux | c | nc | na |
|----------|--------------------------|--------------------------|--------------------------|
| 4 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Mise en place de la signalisation et des repères | c | nc | na |
|--|--------------------------|--------------------------|--------------------------|
| 16 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Mise en place de la signalisation d'entrave | c | nc | na |
|---|--------------------------|--------------------------|--------------------------|
| 20 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 27 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 28 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 29 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 30 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Raisons des non-conformités

Note : joindre une feuille supplémentaire en annexe si nécessaire

conforme : c non-conforme : nc non applicable : na

Préparé par
Ministère des Transports
V-3224 (2012-07)

Date (A-M-J)

Signature du surveillant

Date (A-M-J)

| Feux de circulation | c | nc | na |
|---------------------|--------------------------|--------------------------|--------------------------|
| 31 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 32 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 33 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 34 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Repères visuels | c | nc | na |
|-----------------|--------------------------|--------------------------|--------------------------|
| 35 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 36 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Flèches de signalisation | c | nc | na |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 37 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 38 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 39 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Marquage temporaire de la chaussée | c | nc | na |
|------------------------------------|--------------------------|--------------------------|--------------------------|
| 40 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 41 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 42 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Signaleur | c | nc | na |
|-----------|--------------------------|--------------------------|--------------------------|
| 43 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 44 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 45 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 46 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 47 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 48 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 49 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Divers | c | nc | na |
|--------|--------------------------|--------------------------|--------------------------|
| 50 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 51 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 52 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 53 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 54 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 55 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 56 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 57 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| RAPPORT D'INSPECTION EN SIGNALISATION - PATROUILLE | | | | DATE (J-M-A): _____ HEURE: _____ | | INSPECTION: <input type="checkbox"/> Jour <input type="checkbox"/> Nuit | | Appel au resp. en signalisation | | Intervention Equip. signalisation | | Appel au CIGC (1-877-644-6717) | | Appel au surveillant | | Appel au représentant MTQ | |
|---|--|--|--|---|--|---|--|---|--|-----------------------------------|--|--------------------------------|--|----------------------|----------------------------------|---------------------------|--|
| DOSSIER N°: _____ | | Route - Direction: _____ Municipalité: _____ | | DESCRIPTION DE L'ÉVÈNEMENT | | ACTIONS / SUIVIS | | HEURE DÉBUT | | HEURE FIN | | | | | | | |
| Conforme: <input type="checkbox"/> c Non conforme: <input type="checkbox"/> nc | | A - SIGNALISATION ET DISPOSITIFS DE RETENUE <input type="checkbox"/> c <input type="checkbox"/> nc | | 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ | | 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ | | 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ | | | | | | | | | |
| B - PIVY MOBILES <input type="checkbox"/> c <input type="checkbox"/> nc | | DESCRIPTION DE L'ÉVÈNEMENT | | ACTIONS / SUIVIS | | HEURE DÉBUT | | HEURE FIN | | | | | | | | | |
| Message représentatif de la phase Fonctionnel et bien positionné | | | | | | | | | | | | | | | | | |
| C - FILE D'ATTENTE <input type="checkbox"/> c <input type="checkbox"/> nc | | Direction | | HEURE DÉBUT / HEURE FIN | | LONGUEUR (M) | | ACTIONS / SUIVIS | | HEURE DÉBUT | | HEURE FIN | | | | | |
| Direction: Est / Ouest / Nord / Sud Direction: Est / Ouest / Nord / Sud | | | | | | | | | | | | | | | | | |
| D - SITUATION D'URGENCE <input type="checkbox"/> Oui <input type="checkbox"/> Non | | DESCRIPTION DE L'ÉVÈNEMENT | | ACTIONS / SUIVIS | | HEURE DÉBUT | | HEURE FIN | | | | | | | | | |
| C1 - Jugée mineure (panne, accrochage sans blessés, etc.) C2 - Jugée grave ou majeure (blessés graves, accident mortel, déversement, etc.) | | 1 _____ 2 _____ | | 1 _____ 2 _____ | | 1 _____ 2 _____ | | | | | | | | | | | |
| NOTES: | | | | | | | | | | | | | | | | | |
| NOM DU PATROUILLEUR: _____ | | | | | | | | | | | | N° Véhicule: _____ | | | DATE DE RÉCEPTION (J-M-A): _____ | | |
| SIGNATURE: _____ | | | | | | | | | | | | SIGNATURE: _____ | | | | | |

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 11 – Excavation and backfilling
- .2 Section 32 11 00 – Roadworks
- .3 Section 33 31 00 – Culverts
- .4 Section 31 23 16.26- Rock Excavation

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .3 Province of Quebec
 - .1 An Act Respecting Occupational Health and Safety, R.S.Q., c.S-2.1 (current edition) - Updated 2014.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with 01 33 00 - Submittal Procedures section.
- .2 Submit site-specific Health and Safety Plan: Within seven (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.
- .3 Submit two (2) copies of Contractor's authorized representative's work site health and safety inspection reports to the Ministerial Representative weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 The Ministerial Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven (7) days after receipt of plan. Revise plan as appropriate and resubmit plan

to Ministerial Representative within five (5) days after receipt of comments.

- .8 Ministerial 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 the Ministerial 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.

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 Ministerial Representative prior to commencement of Work.
- .2 Notify Ministerial Representative of this meeting at least five (5) days in advance.

1.7 REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with authorities having jurisdiction over the territory of work.

1.8 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Ministerial Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.9 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 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.
- .3 Contractor shall provide, for the entire duration of the work, signaling appropriate site for visitors.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.6 Safety Code for the Construction Industry.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.11 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factors, hazards or conditions occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Canada having jurisdiction and advise Ministerial Representative verbally and in writing.

1.12 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 specific to activities associated with concrete repair, electrical work and paving.
 - .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 and report directly to and be under direction of the Ministerial Representative.

1.13 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 Canada having jurisdiction, and in consultation with Ministerial Representative.

1.14 CORRECTION OF NON-COMPLIANCE

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

1.15 BLASTING

- .1 Blasting or other use of explosives is only permitted with the authorisation of the Ministerial Representative.
- .2 All Blasting Work is to be performed in accordance with section 31 23 16.26- Rock Excavation.

1.16 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Ministerial Representative.

1.17 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 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 the pollution and the disturbance of the the environment during the construction.

1.2 NON-COMPLIANCE OF REQUIREMENTS

- .1 The failure to comply with any clause in this section of the specification or following the emission of a non-compliance notice is subject to a permanent retention of sums of one thousand (1 000) dollars applicable as a fine for each infraction factually noted by the Ministerial Representative or one of their agents. The same shall apply for the non-compliance with any article of the CCDS with respect to the protection of the environment.
- .2 Any infraction that shall not be corrected by the following day shall be subject to an additional permanent retention of sums of the same amount. Each following day shall be subject to the same until the infraction is corrected. Additionally, any expense related to the damage caused to the environment shall be at the costs of the Contractor notably any analysis, report, works required to manage restoration of fauna and wildlife and indemnities.
- .3 In the case of non-execution by the contractor of repairs or damages, the Owner/Applicable Public Authority shall proceed with corrective works and will charge the contractor the cost of such works and delays as permanent retention of sums.
- .4 Protection of the environment: Prevention/control of pollution and disturbances to the environment and surrounding habitat during construction.
- .5 In the case of work done for the federal government; sections of Division 1 have priority over the technical sections of other divisions of project specifications. The Contractor shall at all times respect the National Parks Act and Regulations Reference Standards.

1.3 PRESENCE OF WILDLIFE ON SITE

- .1 To ensure the safety of workers, visitors and animals, stop traffic or machinery in the presence of wild animals on the site, especially large animals: moose, deer and black bear. Make a safe escape route to the animal and keep a safe distance. Observe from a distance, without approaching (avoid disturbing and harassing) and contact the service of Conservation park for advice or support if needed.
- .2 The contractor may never destroy any known wildlife habitat (beaver dam, bird nest, fox den, etc.).

1.4 METHOD OF WORK

- .1 Contractor must submit his method of work and sediment control plan one (1) week prior to the start of the work for approval by the Ministerial Representative.
- .2 During preparation of the site, the contractor must minimise the exposure and disturbance of the soil at the work locations.

1.5 ENVIRONMENTAL SUPERVISION FORM

- .1 Contract must refer to "Environmental Supervision form" provided in appendix and implement all the required mitigation measures for each activity.

1.6 FIRES

- .1 Fires and burning of rubbish is forbidden.

1.7 WASTE DISPOSAL

- .1 Do not bury rubbish and waste materials on Parks Canada property.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers. Particular attention must be made during concrete works given that concrete has an adverse effect of aquatic wildlife.
- .3 Waste must be evacuated outside the Parks Canada property while respecting regulations federal and provincial environmental protection. Waste materials also include demolition material not withhold by Parks Canada, hazardous materials (liquid and solid) and water containing suspended solids.

1.8 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water. The Contractor must obtain the

authorization from the Ministerial Representative concerning the localization of the permitted reject points.

- .2 Do not pump water containing suspended materials, if not previously properly filtered, into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances, according to local regulations.
- .4 The Contractor shall keep a flow at the river downstream of the work area.
- .5 The watercourse bed must regain original profile after work.

1.9 TREES, SHRUBS AND PLANT PROTECTION

- .1 Protect trees, shrubs and plants on site and adjacent properties where indicated. Any plantation that the Ministerial Representative deems sufficiently damaged by the Contractor to question the plant capacity to survive, must be replaced by the Contractor, at the rate of 2 equivalent plantations for every damaged plant identified by the Ministerial Representative.
- .2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Minimize stripping of topsoil and vegetation.
- .4 The Contractor must remove and stockpile crop canopy for reuse before works.
- .5 Tree removal at the work site has already been effected. Do not remove any trees without a written notice by the Ministerial Representative. It is strictly forbidden to remove trees between the 15th of May and the 15th of August. In the case that a tree is obstructing the works, the contractor must immediately advise the Ministerial Representative and obtain their approval prior to removing said tree.
- .6 The Contractor shall obtain the approval of the Ministerial Representative for pruning. Should the contractor proceed with pruning prior to receiving the required authorisation, a permanent retention of a sum of 100\$ may apply to each tree/bush cut or pruned to the amounts owed the contractor.
- .7 When plantations should be moved using a transplantation bucket, the Contractor must wrap them in a burlap bag with enough soil to contain all the roots and provide them with adequate protection. Hold the damp earth at any time. Keep away from the Sun. Replanting once the work completed at origin point or at the place indicated by the Ministerial Representative.

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1.10 WORK ADJACENT TO WATERWAYS

- .1 It is forbidden to extract any natural or artificial material from or nor the watercourse bed, including pumping water for site purposes.
- .2 Residues and dust from treated wood may not be discharged or placed in contact with water draining into waterways.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 The contractor shall furnish at least seven (7) days before the beginning of work, a plan for environmental protection for approval. This plan must clearly show all elements that are used to protect waterways.
- .5 The Contractor sets up all necessary means (hay in bag, filter fence etc.) to eliminate any discharge from sediments in the brooks. Examples of arrangement are shown in appendix f the present section.
- .6 The contractor shall determine the type of cofferdam or temporary works and method of construction and demolition, according to the characteristics of the soils encountered and watercourse to avoid environmental pollution. The design of temporary structures (cofferdams, dikes, etc.) shall consider a flooding event of two years and an additional protection of at least 300 mm.
- .7 Where cofferdams are required, the Contractor must submit to the Ministerial Representative plans of such cofferdams bearing the seal and signature of an accredited engineer in good standing with the *Ordre des Ingénieurs du Québec*.
- .8 Should an element not be constructed on piles, the design of cofferdams and temporary retaining works must take into account the preservation of the soils beneath its foundation.
- .9 Cofferdams materials must be clean. Soils used for an earthen dam must not contain more than 10% fine material passing through an 80 um sieve, unless they are contained in a geotextile
- .10 After construction of a cofferdam and after its inspection by its designing engineer, the Contractor must issue a written letter by the designing engineer of the cofferdam attesting to its conformity to the plans to the Ministerial Representative. The letter should state the date and time of the inspection.
- .11 If the construction site is isolated by cofferdams and pumping is necessary, water must be directed into a vegetated area at least 20m from a waterway.
 - .1 The place used for cofferdam must be left in condition at least equivalent to the existing,

- .2 In the absence of a vegetated area adequate to control water containing sediment or suspended solids, sedimentation basins must be used.
- .12 The pumps must be fitted to prevent the fish from getting into the pumping system.
- .13 When the cofferdam is no longer needed, the Contractor must remove it: removal shall be effected downstream towards upstream. Before proceeding with the removal of a cofferdam in cold weather, the Contractor must fragment the material forming the top of the cofferdam.
- .14 Traffic is forbidden in watercourse. Design and construct temporary crossings to minimize erosion to waterways.
- .15 Do not skid logs or construction materials across waterways.
- .16 All work done within the limit dates of the two (2) year return high water mark is forbidden between September 16 and May 31 inclusively in the Cap des Rosiers creek and the stream crossing Boulevard Cap de Rosiers (existing arched culvert TTOG ch +-4+435), which is recognised as a fish habitat, unless a cofferdam or temporary work allows work to be done in a restricted space.
- .17 Watercourses recognized as a fish habitat cannot be blocked. The Contractor must assure a flow rate downstream from the works equivalent to the normal flow rate of the watercourse.

1.11 POLLUTION PREVENTION

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local, federal, provincial, municipal authorities' emission requirements.
- .3 Idling of vehicles is forbidden unless special permission from the Ministerial Representative.
- .4 Provide temporary enclosures to prevent sandblasting and other extraneous materials from contaminating air beyond application area.
- .5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.12 WATER AND SOIL POLLUTION PREVENTION

- .1 The Contractor and subcontractors who perform work requiring the use of motorized equipment, fuel transfer or using hazardous products, must know and implement procedures to be followed in case of spills. This procedure should be displayed at the sight of employees at the work site.

- .2 The Contractor shall ensure that machinery, tooling, and equipment that will be used for the execution of the work, are safe, clean and in good working condition. The Ministerial Representative reserves the right to deny access or to expel the construction machinery, tooling and equipment that do not meet these requirements. Visibly badly maintained equipment and presenting evidence of leaks or the risk of leaks will be returned at the expense of the Contractor or the owner of the equipment, without charge to Parks Canada. Furthermore, the machinery allowed to traffic or work at less than 30 m from a watercourse, must use biodegradable vegetable oil.
- .3 No storage of material or equipment outside the designated deforested area is permitted.
- .4 If the Contractor must store hazardous materials and hydrocarbons, for the purposes of the project, there will be on-site retention tanks storage.
- .5 General maintenance, refueling and cleaning of equipment must be done at more than 30 m from the watercourse.
- .6 The Contractor shall have on site an emergency kit in order to respond to events requiring environmental emergency.
- .7 Without limitation, this kit of intervention must include and gather a minimum of equipment and devices to contain any spills to minimize the risk of contamination spreading caused by an oil spill, hazardous products or other contaminants. This intervention package identified EMERGENCY - ENVIRONMENT must contain:
 - .1 An absorbent bead of 3 inches in diameter, length of 12 feet;
 - .2 An absorbent bead of 3 inches in diameter, length of 4 feet;
 - .3 Twenty-five layers of absorbent;
 - .4 Two bags of 7 litres absorbent (Sphagnum moss Type);
 - .5 An epoxy stick.
 - .6 Two DANGER warning posters;
 - .7 Three recovery plastic bags;
 - .8 Stickers TDG (transport of dangerous goods) class 4.1;
 - .9 An indelible marker;
 - .10 Two pairs of rubber gloves;
 - .11 Two pairs of protective eyewear;
 - .12 Tape type 'Duct Tape';
 - .13 A few tools: pliers and screwdrivers;
 - .14 Declaration forms "Environmental incident report" from the garrison, provided by the Representative of Parks Canada.

- .8 Intercept runoff from off-site construction and maintain the waters off site by routing them to facilities or stabilized areas.
- .9 Drain off from the construction site runoff by sending to the approved facilities that promote sedimentation before they reach a water body.
- .10 Provide temporary protection to prevent soil loss caused by rain and snow melt.
- .11 Cover and protect Piled material during events such as heavy rains or extensive stoppage of work in order to avoid sedimentation and erosion.
- .12 Provide plans based on to the head of drainage, soil stability and development of the site.
- .13 The sediment barriers (straw bales or silt fences) are installed to keep the sediment within the boundaries of the site and avoid that sediments reach the water body.
 - .1 The filter straw bale is constructed using straw bales tightly assembled and anchored in a trench (Appendix 2). The trench for receiving straw bales must be dug at the base of a slope following the contours so that the barrier intercepts the runoff. The bales must be carefully stuck in the trench so that they are properly nested in it,
 - .2 The silt fence consists of geotextile, for this purpose, supported by wooden posts (Appendix 3). At base, the geotextile is well embedded in the ground to ensure efficiency,
- .14 The sediment trap and filter berm are generally matched and installed in a ditch (Appendix 4). The hatch is a cavity carved into the ditch to slow the flow and allow sediment deposition. The berm is a temporary gravel ridge or crushed stone which dissipates the energy of the water flowing in the ditch. When the sediment trap is 50% filled, it must be emptied and, where necessary, the filter must be cleaned or replaced.
- .15 Temporary facilities in damp environment are prohibited. In addition, soil conditions and drainage must be maintained.
- .16 Limit the areas to be stripped in order to avoid erosion. At the end of each working day, the Contractor shall protect with membranes or sediment fences, any exposed surface vulnerable to erosion and may produce sediment to a water body or to a ditch discharging into a hydric environment.

1.13 PROCEDURES IN CASE OF SPILL, HAZARDOUS MATERIALS OR OTHER CONTAMINANT

- .1 In the event of a spill, the intervention and cleaning operations of the spill must be carried out by the Contractor in accordance with the following procedure:
 - .1 Ensure the safety of people and immediately retrieve the spill.
 - .2 If the Contractor is unable to contain or to immediately recover the spill or spill occurs in water, it should notify, depending on the affected area:
 - .1 Local fire (9-1-1) Service
 - .2 Parks Canada Dispatch 1-888-762-1422
 - .3 The Contractor must immediately report the spill (whatever the amount) to the Ministerial Representative as well as to the environment officer and prepare and submit to the Ministerial Representative, the intervention report provided by the Ministerial Representative.
 - .4 The Contractor liable for any spill of product deemed harmful to the environment or property of Parks Canada, and if applicable, the Contractor shall execute immediately, at its expense, the corrective measures prescribed by the Ministerial Representative or environment officer.
 - .5 Failing to intervene adequately and to the satisfaction of Parks Canada because of the size or the type of spill, the cost of complementary interventions that require staff or machinery of Parks Canada, will be brought to the responsibility of Contractor.
 - .6 Intervention report: in case of intervention the Contractor shall complete without delay the event declaration (environmental incident report, provided by Ministerial Representative), and submit it to the Ministerial Representative.
 - .7 This document will be presented at the preliminary meeting before the start of the work.

1.14 HAZARDOUS PRODUCTS TEMPORARY STORAGE

- .1 Hazardous products must be collected into blocks separated by a horizontal distance of 1 m. Incompatible products must be separated by a horizontal distance of 3 m. The blocks shall be located at least 30 m from a trees/shrubs lines and at least 6 m from a grass/herbaceous covered surface.
- .2 Safety distances must be observed 30 m from watercourses, 15 m of tents and 3 m of fuel equipment and roads. Access must be provided to emergency responders.

- .3 Portable tanks must meet road standards. During the transfer of fuel, fuel tank must be grounded. The vehicle being refuelled or tank must be connected to the tank truck, cable grounding, in ensuring that contact is established on bare metal.
- .4 Storage areas are equipped with a system of retention or capture of liquids (Polyspill pallets, Bowl, waterproof coatings, donkey, trenches, drains blocked or connected to a recovery system). Rainwater is drained regularly or the storage area is protected to avoid the accumulation of rainwater.
- .5 Containers for flammable and combustible liquids must be stored in an upright position.
- .6 Containers in poor condition, should be immediately disposed outside the Parks Canada territory, in accordance with the most stringent environmental standards. Containers should be identified according to WHMIS.
- .7 The dangerous materials temporary storage must indicate risks with the TDG (transport of dangerous goods) placard-boards.

1.15 NON-COMPLIANCE NOTICE

- .1 A non-compliance notice will be issued in writing to the Contractor by the Ministerial Representative whenever Contractor doesn't comply with a law, a regulation or a provincial or municipal permit, or any other item of the Environmental Plan protection implemented by the Contractor.
- .2 Upon receipt of a notice of non-compliance, the Contractor shall propose corrective measures to the Ministerial Representative, who approves or not the Contractor proposal.
- .3 The Contractor shall obtain the written approval of the Ministerial Representative prior to the implementation of the proposed measures.
- .4 The Ministerial Representative will order cessation of work until satisfactory corrective action.
- .5 No extra time and no adjustment will be accorded to the work stoppage.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

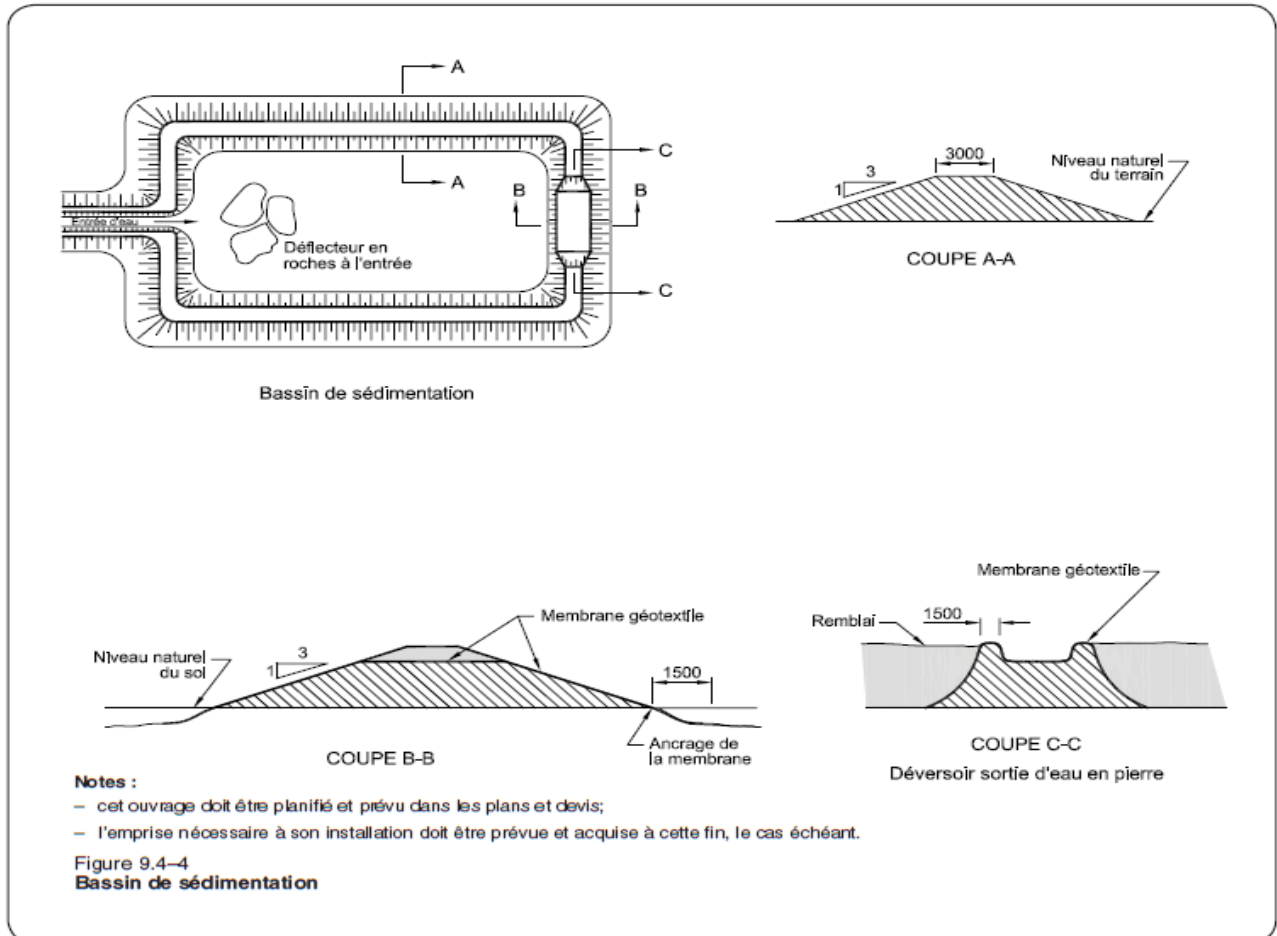
Part 3 Execution

3.1 SITE RESTORATION

- .1 The entrepreneur will have to restore the bed and the banks of the aquatic zones affected by the works (size grading of the substratum, the profile of the bed, etc.) following the dismantling of the temporary works on all the affected surfaces.
- .2 The entrepreneur will have to limit the riprap of the coast as high as the natural line of high tides and seed/plant the shore from the limit of the riprap by means of techniques of plant engineering recognized favoring strata shrubby and herbaceous overhanging. The restoration of the shores must be begun as fast as possible after the completion of the earth-moving by favoring the use of native species.
- .3 The entrepreneur will have to recondition ditches damaged by the machinery (slope of flow, retaining wall of banks, etc.).

Appendix 1

Sedimentation Bassin



Appendix 2

Filter straw bale

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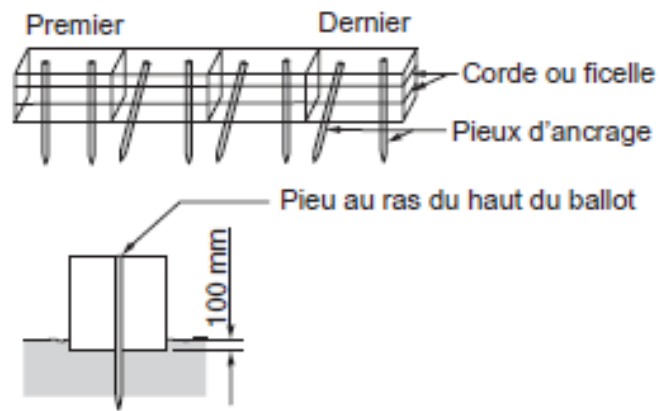
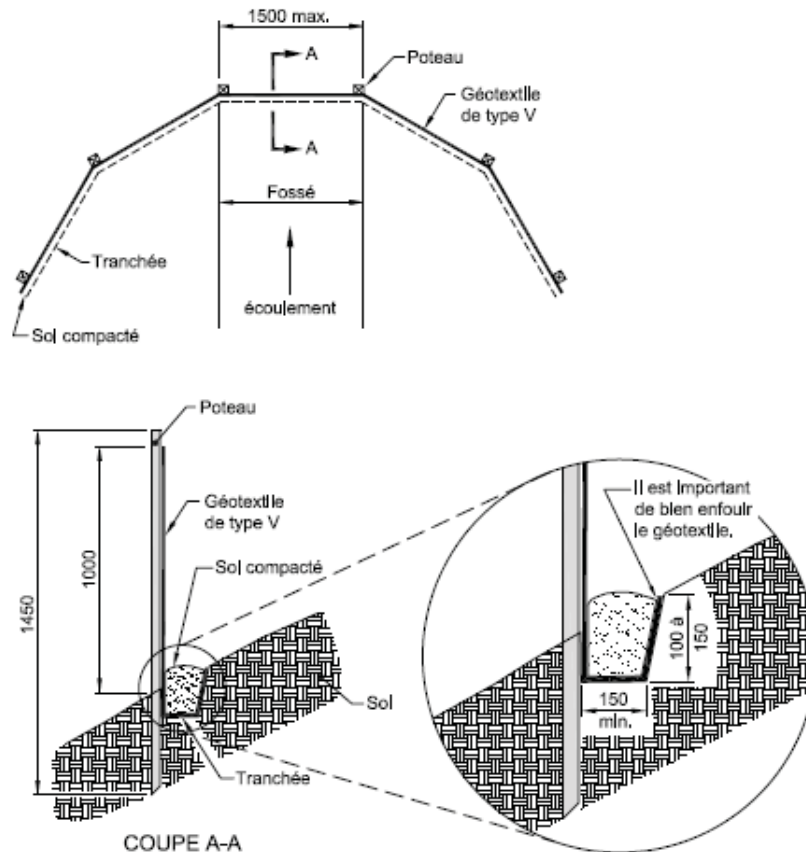


Figure 9.4-1
**Exemple d'ancrage de ballots de paille pour
disposition en série**

Appendix 3

Barrier with geotextile



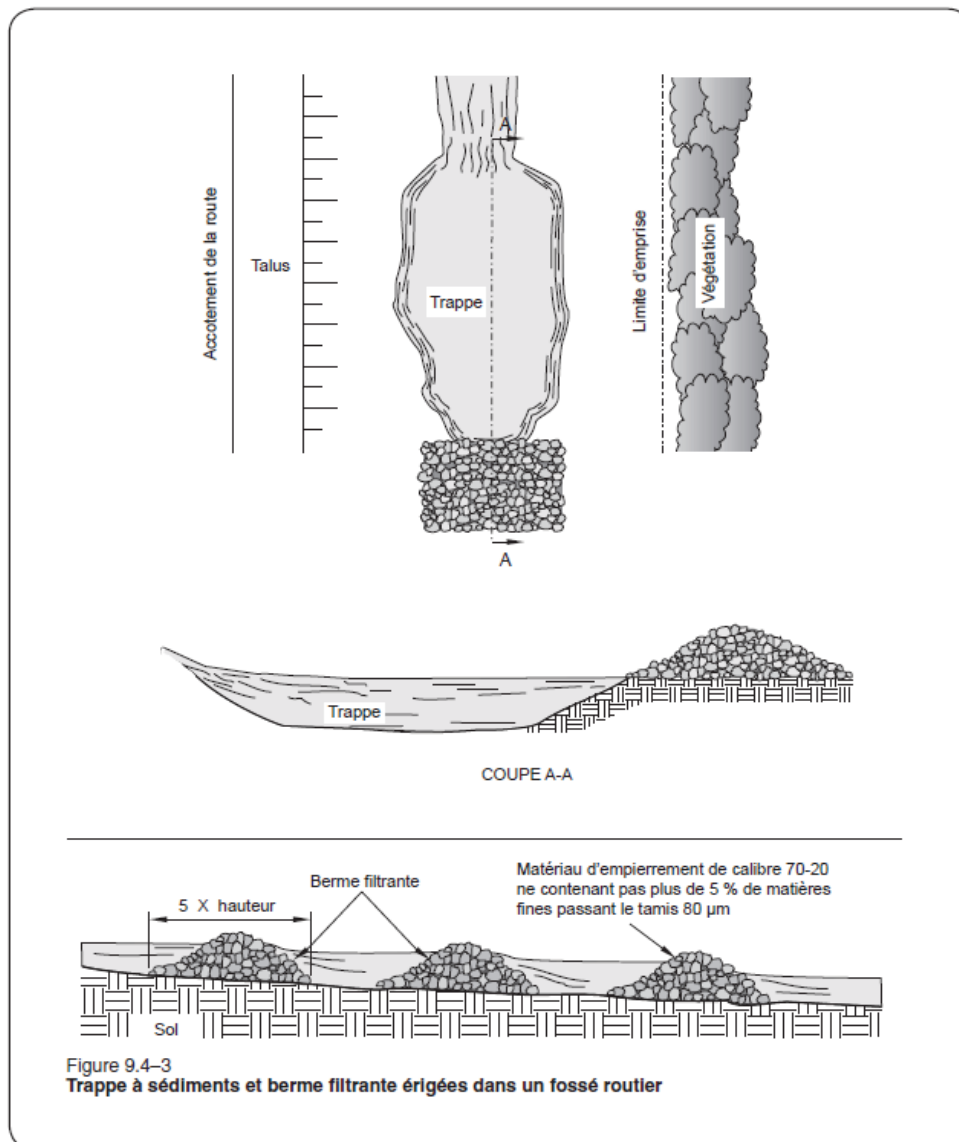
Note :

– les cotes sont en millimètres.

Figure 9.4-2
Installation d'une barrière munie d'un géotextile

Appendix 4

Sediments trap and filter berm



Appendix 5

Environmental Supervision Form

| IDENTIFICATION DU PROJET | | | |
|---|--|-----|-------------------|
| Site : | | | |
| Titre du projet : | | | |
| Date de réalisation des travaux | | | |
| Date de réalisation de la surveillance : | | | |
| Activité de surveillance réalisée : | | | |
| | Visite sur le terrain lors des travaux | | |
| | Autre activité de surveillance (spécifier) : | | |
| Mesures d'atténuation | OUI | NON | Si NON, raison(s) |
| Utilisation de la machinerie | | | |
| Utiliser des équipements et des véhicules en bon état de fonctionnement selon la réglementation en vigueur. | | | |
| Limiter les déplacements terrestres et fermer le moteur de la machinerie inactive. | | | |
| Procéder à l'inspection et l'entretien des engins et de leurs systèmes d'échappement afin qu'ils soient en bon état. | | | |
| Éviter tout mouvement brusque de la machinerie lors des travaux en milieu aquatique. | | | |
| Arrêter les travaux lors de conditions climatiques extrêmes. | | | |
| Si la turbidité de l'eau à l'intérieur des ruisseaux devenait importante, l'entrepreneur devra réduire la vitesse d'exaction, d'enrochement ou tous autres travaux provoquant cette turbidité. | | | |
| Délimiter le périmètre du chantier et y interdire l'accès au public. Assurer la sécurité des travailleurs, des visiteurs et du public en général en balisant les sites des travaux et en utilisant des barrières de protection et une signalisation adéquate. | | | |
| Émettre un avis dans les médias locaux et auprès de la population locale pour informer le public de la période d'exécution et de la zone des travaux. | | | |
| Préconiser l'utilisation d'huile végétale pour tous les équipements en contact avec l'eau. | | | |
| Les aires de stationnement, de lavage et d'entretien de la machinerie ainsi que d'entreposage des équipements sont situées à plus de 30 m d'un plan d'eau. | | | |
| Nettoyer la zone de travaux et d'entreposage temporaire de façon adéquate et régulière. | | | |
| Procéder le plus rapidement possible à la remise en état des lieux après les travaux. | | | |

Défaillances et accidents

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| | | | |
|--|--|--|--|
| Posséder un plan d'urgence et veiller à son application immédiate en cas d'un déversement accidentel et contacter les organismes suivants sans délai : Environnement Canada : 1-866-283-2333 et Urgence-Environnement du Québec : 1-866-694-5454. | | | |
| S'assurer de la tenue d'une réunion avec le personnel de chantier afin de l'informer des exigences contractuelles en matière d'environnement et de sécurité, incluant les composantes du plan d'urgence. | | | |
| Prévoir des trousse de récupération (boudins et matériaux absorbants oléophiles et hydrofuges, polyéthylènes, sacs étanches, contenants étanches, pelles, gants, obturateurs de fuites, etc.) en permanence sur le site pour les produits pétroliers et les déchets et des matières absorbantes en cas de déversement. | | | |
| Ne pas manipuler ni stocker d'hydrocarbures et de produits dangereux à moins de 30 m de la rive. | | | |
| Identifier et utiliser un site d'entreposage temporaire et isolé pour les équipements de matériaux. Il devra être situé à une distance minimale de 30 m de tout point d'eau. | | | |
| En cas de déversement en milieu aquatique, les eaux contaminées seront confinées et récupérées par une firme spécialisée et acheminées vers un centre de traitement autorisé par le MDDELCC. | | | |
| Commentaires : Observations sur le terrain, présence de la faune, mauvaise gestion des déchets, présence d'huiles usées, fuites sur la machinerie, travaux réalisés non pris en compte dans l'évaluation environnementale, tout détail n'étant pas mentionné dans les mesures d'atténuation, etc. | | | |
| GESTION (NOMBRE ET ANNOTATION NUMÉRIQUE) DES PHOTOGRAPHIES POUR CHACUN DES SITES | | | |
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |

| RÉALISATION DE LA SURVEILLANCE | |
|--------------------------------|--|
| Préparé par : | |
| Date : | |
| Organisme : | |
| Téléphone et courriel : | |

APPENDIX 6



Note technique

| | |
|---|--|
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| Projet: Réfection majeure de la route 132 au Parc National Forillon – Phase II | Date: 19 mars 2015 |

Référence: 384-P-0007430-100-HY-N-0002-00

1. Introduction

La présente note technique a pour objectif d'apporter les informations hydrauliques nécessaires à la conception des batardeaux temporaires requis durant la construction du futur ouvrage de franchissement du ruisseau Cap-des-Rosiers supportant la route 132 dans le Parc National de Forillon. Cette note fait suite au rapport de l'étude hydraulique pour la conception du futur pont, émis en février 2015 par Stantec et identifié par le numéro 384- P-0007430-100-HY-R-0001-00.

2. Critères de conception des batardeaux

Les critères de conception suivants ont été retenus pour l'analyse hydraulique :

- Le sommet du batardeau sera établi 300 mm au-dessus du niveau d'eau le plus haut rencontré au droit du futur ouvrage suivant une récurrence de 2 ans. Les niveaux atteints pour une récurrence de 100 ans seront donnés à titre d'information;
- Les faces extérieures du batardeau devront être recouvertes d'un revêtement en pierres. Le choix d'une protection alternative (sacs de sable, blocs,...) est laissée à l'appréciation de l'entrepreneur, mais n'est pas étudiée ici ;
- Les travaux auront lieu entre le 1^{er} juin et le 15 septembre.

D'un point de vue structurel, le batardeau est conçu suivant des directives internes à Stantec¹ :

- Espacement de 300 mm entre le bord vertical de la semelle et le coté de l'excavation au fond de celle-ci;
- Pente d'excavation du roc de 3V pour 1H;
- 300 mm de dégagement horizontal entre le haut de l'excavation et le commencement du batardeau en remblai à sa base.

Les pentes du batardeau en remblai sont ensuite considérées selon deux situations :

- Une situation optimale où la pente est de 1,2H:1V (pente de 40°, soit la pente de dépôt naturelle d'un enrochement);
- Une situation défavorable, où la pente est de 1,5H:1V.

Enfin, une largeur en crête de 300 mm a été retenue.

¹ Courriel de Luc Gilbert, ing., Stantec, daté du 17 mars 2015

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3. Conditions fluviales et maritimes retenues

La position des batardeaux dans un secteur du ruisseau influencé par les conditions maritimes et fluviales impose de prendre en considération ces deux conditions pour la conception.

Les conditions fluviales et maritimes sont déterminées à partir des mêmes données que celles utilisées dans le cadre de l'étude hydraulique pour la conception du pont. Les résultats diffèrent de ceux utilisés dans le cadre de la conception du pont car la période de l'année considérée pour la conception des batardeaux couvre uniquement les mois de juin à septembre inclusivement.

Les conditions maritimes sont présentées dans le tableau ci-dessous pour des récurrences de 2 et 100 ans, ainsi que pour des moyennes d'extrêmes journaliers qui seront explicitées par après. Les résultats sont issus de l'analyse des données enregistrées à la station marégraphique de Rivière-au-Renard n°2330. Tous les niveaux sont donnés par rapport au niveau moyen des mers et peuvent donc être considérés comme géodésiques.

Tableau 1: Niveaux marins retenus

| Évènement | Moyenne des minimums journaliers entre juin et sept | Moyenne des maximums journaliers entre juin et sept | 2 ans | 100 ans |
|------------------|---|---|-------|---------|
| Niveau marin (m) | -0,55 | 0,79 | 1,27 | 1,56 |

Les conditions fluviales sont présentées dans le tableau ci-dessous pour des récurrences de 2 et 100 ans, ainsi que pour le débit moyen du ruisseau entre juin et septembre. Les résultats sont issus de l'analyse et de la transposition des données enregistrées à la station hydrométrique de Petite-Rivière-au-Renard n°02QC014.

Tableau 2: Débits du ruisseau Cap-des-Rosiers retenus

| Évènement | Débit moyen entre juin et septembre | 2 ans | 100 ans |
|----------------------|-------------------------------------|-------|---------|
| Débit associé (m³/s) | 0,46 | 4,36 | 33,6 |

L'utilisation de moyennes (aussi bien pour les niveaux marins que le débit) est importante car les conditions maritimes et fluviales sont des événements non-corrélés. Autrement dit, la concomitance d'une marée haute de récurrence X et d'une crue de récurrence X constitue un événement de période de retour 2 fois X. Ainsi, afin de ne considérer que des événements de récurrence 2 ans, on appliquera les combinaisons suivantes pour la conception des batardeaux.

Tableau 3: Scénarios retenus pour les niveaux d'eau et de vitesse de conception

| Objectif de conception | Condition marine | Condition fluviale | Commentaire |
|---|--|---|--|
| Élévation de la crête du batardeau | Grande marée de pleine mer supérieure entre juin et septembre et de récurrence 2 ans | Débit moyen entre juin et septembre | On retiendra l'évènement générant le niveau le plus haut |
| | Moyenne des maximums journaliers entre juin et septembre | Débit de crue entre juin et septembre de récurrence 2 ans | |
| Enrochements de protection du batardeau | Moyenne des minimums journaliers entre juin et septembre | Débit de crue entre juin et septembre de récurrence 2 ans | On considère ici une marée basse afin d'obtenir les vitesses les plus rapides. |

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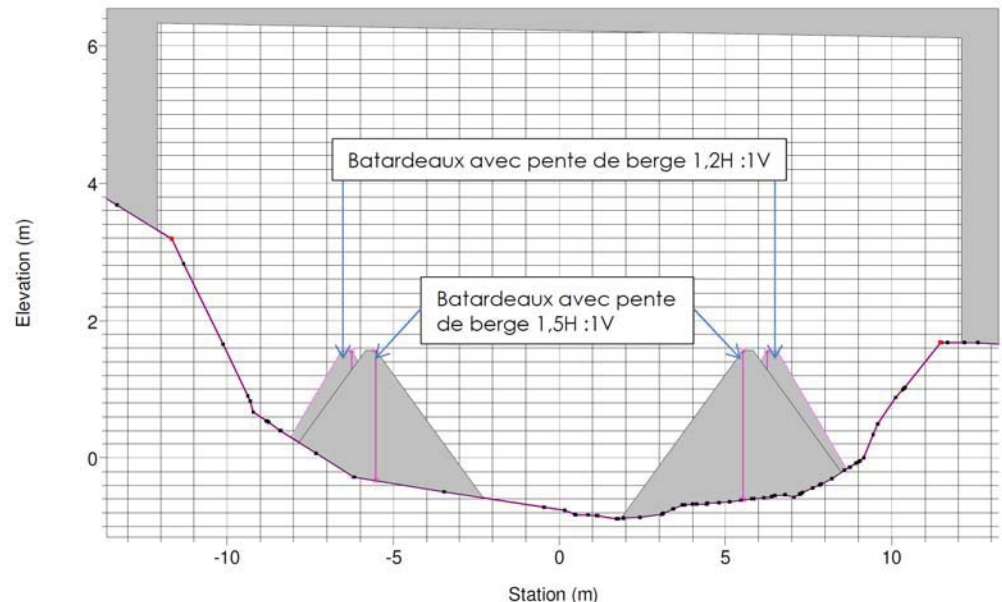
Reference: 384-P-0007430-100-HY-N-0002-00

4. Impacts hydrauliques et protections des batardeaux

Conçus suivant les critères de conception énoncés à la partie 2 de cette note, les batardeaux offrent une distance de crête à crête de 12,52 m lorsque la pente des berges est de 1,2H :1V et de 11,05 m lorsque celle-ci est de 1,5H:1V. Ce sont les écartements maximums possibles d'après les conditions de mise en place des batardeaux retenues pour le projet.

La section en travers ci-dessous représente les batardeaux tels que représentés dans le modèle HEC-RAS. Le modèle n'inclut pas les zones excavées, mais cela est sans incidence sur les calculs car aucun écoulement ne s'y produit.

Figure 1: Section en travers des batardeaux



L'impact des batardeaux sur les niveaux d'eau est considéré dans ces conditions. Pour une récurrence de 2 ans, le niveau le plus haut est atteint pour les conditions en marée haute et est de 1,27 m. Les crêtes des batardeaux sont placées à l'élévation 1,57 m, afin d'inclure une revanche de 300 mm. À noter que la crête du batardeau est alors 1 cm plus haute que le niveau atteint pour une marée haute de récurrence 100 ans.

Plus généralement, quelle que soit la pente des berges et pour des événements de récurrence 2 à 100 ans, les niveaux d'eau atteints en crue restent inférieurs aux niveaux atteints pour des grandes marées hautes si l'espacement disponible pour l'écoulement entre les batardeaux est tel que montré à la figure 1.

Par contre, si les distances de crête à crête devaient être réduites, il y a une limite au-delà de laquelle les niveaux d'eau atteints en crue deviennent supérieurs à ceux atteints pour des grandes

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marées hautes et l'élévation du batardeau doit être adaptée en conséquence. Pour la crue 2 ans, cette limite est un écart inférieur à **5 m** pour des pentes de berge de 1,2H:1V et **6 m** pour des pentes de berge de 1,5H:1V. Pour la crue 100 ans, aucun rétrécissement n'est possible sans devoir rehausser la crête des batardeaux.

Les protections en enrochement retenues pour les batardeaux sont fonctions de la vitesse d'écoulement rencontrée et de la pente du remblai. La vitesse varie selon la période de récurrence retenue pour la conception, l'espacement entre les crêtes des batardeaux et les pentes de berge des batardeaux. Afin de baliser la conception, les calculs ont été faits pour des pentes de berge du remblai de 1,2H :1V et 1,5H :1V, des crues de récurrence 2 et 100 ans et des espacements entre les batardeaux minimums et maximums.

Les résultats sont donnés dans le tableau ci-dessous, où sont également résumés les paramètres liés aux niveaux d'eau.

Tableau 4: Impact hydraulique des batardeaux et protections

| | Récurrence de l'évènement considéré | |
|---------------------------|---|---------|
| | 2 ans | 100 ans |
| Pente de berge de 1,2H:1V | <u>Espacement maximal de 12,52 m</u> Largeur au miroir niveau haut 2 ans de 11,8 m Vitesse d'écoulement de 1,1 m/s Enrochements type 2 calibre [100-200 mm] | |
| | Vitesse d'écoulement de 2,3 m/s Enrochements moyens D ₅₀ = 0,5 m | |
| Pente de berge de 1,5H:1V | <u>Espacement minimal de 5 m</u> Largeur au miroir niveau haut 2 ans de 4,3 m Vitesse d'écoulement de 3 m/s Enrochements moyens D ₅₀ = 700 mm Mesures de dissipation d'énergie importantes à la sortie du rétrécissement | |
| | <u>Espacement maximal de 11,05 m</u> Largeur au miroir niveau haut 2 ans de 10,2 m Vitesse d'écoulement de 2,0 m/s Enrochements type 2 calibre [100-200 mm] | |
| Pente de berge de 1,5H:1V | Vitesse d'écoulement de 3,4 m/s Enrochements moyens D ₅₀ = 0,5 m | |
| | <u>Espacement minimal de 6 m</u> Largeur au miroir niveau haut 2 ans de 5,1 m Vitesse d'écoulement de 3 m/s Enrochements moyens D ₅₀ = 700 mm Mesures de dissipation d'énergie importantes à la sortie du rétrécissement | |

Selon la pente de berge, la crue de conception et l'espacement de crête à crête des batardeaux, le tableau fournit les largeurs au miroir pour un niveau haut de récurrence 2 ans, les vitesses d'écoulement rencontrées et les protections requises (par défaut le D₅₀ requis, ou le calibre si correspondant à un enrochement typiquement utilisé dans les projets routiers).

La présentation des résultats pour des crues 2 et 100 ans et des espacements min et max entre les deux batardeaux permet de mesurer l'impact de se prémunir contre une crue de récurrence plus que 2 ans où de l'impossibilité de conserver l'espacement maximum entre les batardeaux.

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5. Analyse des résultats

Les conditions particulières au site (influence de la marée) font que l'on peut construire les batardeaux à la même élévation tant que l'espace de crête à crête entre les batardeaux est maintenu supérieur à 5 m si les pentes de berge sont de 1,2H :1V et 6 m si les pentes de berges sont de 1,5H :1V. Dans ces conditions, le niveau d'eau maximal reste inchangé et est atteint pour une marée haute de récurrence 2 ans. Il n'apparaît pas nécessaire ni opportun de réduire à moins de 6 m la largeur du cours d'eau. Par conséquent, pour une récurrence de 2 ans, le niveau de la crête du batardeau reste égal à 1,57 m.

Les pentes de berge selon lesquelles les batardeaux ont un impact restreint; bien que cela engendre des vitesses plus importantes, la pente plus douce suivant laquelle les enrochements sont déposés fait que finalement les mêmes protections sont à retenir. Seule la largeur au miroir est impactée, mais cet impact est limité (-1,6 m) si une pente de 1,5H :1V est retenue au lieu de 1,2H:1V).

La crue de récurrence retenue pour la conception des batardeaux est importante car les vitesses augmentent significativement avec la période de récurrence choisie, nécessitant par conséquent des protections plus importantes.

L'espacement entre les batardeaux a un impact très important sur les conditions d'écoulement dans la zone des travaux. Si l'espacement maximal est conservé, l'écoulement ne génère pas de problème particulier. Si l'espacement est réduit, le rétrécissement engendre une contraction de l'écoulement, une augmentation des vitesses au droit des batardeaux et, surtout, un passage en régime torrentiel entre les batardeaux suivi d'un ressaut hydraulique en aval. Les turbulences générées sont alors très importantes et nécessitent la mise en place d'enrochements massifs et de dissipateurs d'énergie en aval de la zone des travaux. Cette issue ne paraissant pas envisageable dans le cadre du projet, il apparaît primordial de conserver l'espacement maximal entre les batardeaux.

Il est laissé à l'appréciation et à la responsabilité du constructeur de s'assurer que les enrochements mis en place soient correctement gradués avec ($D_{max}/D_{min} < 2.5$) et que l'usage de pierres allongées ou rondes soit proscrit. Les enrochements devront être mis en place sur une épaisseur de 2 fois le D_{50} retenu. À noter que les vitesses maximales sont atteintes lors de la marée basse, situation durant laquelle la hauteur de la lame d'eau est moins importante. On se concentrera donc particulièrement sur la base des batardeaux, le sommet présentant moins de risque d'érosion.

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6. Recommandations

Pour permettre la réalisation des travaux hors d'eau jusque une récurrence de 2 ans, la mise en place de batardeaux en remblai, simultanément et autour des deux culées du futur pont, doit s'élever jusqu'à l'élévation géodésique minimale de 1,57 m et peut restreindre le cours d'eau - d'un point de vue hydraulique uniquement - à une largeur minimale de 11 m de crête à crête.

Dans ces conditions, une pente de berge des batardeaux de 1,2H :1V peut être visée, mais une pente de 1,5H :1V est acceptable. Les protections peuvent consister en un revêtement de pierres de type 2, soit un calibre [100-200], un D_{50} de 150 mm, et une épaisseur de 300 mm. Une attention particulière devra être accordée à la base des batardeaux en contact avec le cours d'eau, là où les phénomènes d'érosion sont les plus à même de se développer.

Ces valeurs s'appliquent uniquement pour des travaux se déroulant entre les mois de juin et septembre inclusivement. Pour des travaux à d'autres périodes de l'année, il conviendra de compléter la présente note ou de se référer aux valeurs du rapport de l'étude hydraulique identifié par le numéro 384- P-0007430-100-HY-R-0001-00.

Durant les travaux, il est recommandé d'apporter la plus grande attention aux prévisions marégraphiques et météorologiques et à la concomitance d'une forte crue avec une forte marée; cette conjonction peut entraîner des niveaux d'eau plus hauts au droit de la zone des travaux. Attention, les prévisions marégraphiques ne prévoient pas l'influence des conditions climatiques sur les niveaux marins, à savoir que des vents et des dépressions atmosphériques peuvent engendrer des niveaux plus élevés que prévus.

Les prévisions marégraphiques à 7 jours sont disponibles sur le site du MPO² et sont données en hauteur par rapport au zéro des cartes. Il est nécessaire de retrancher 0,997 m aux élévations par rapport au niveau zéro des cartes pour obtenir un niveau géodésique, soit par rapport au niveau moyen des mers.

On mentionnera enfin que la plus forte crue enregistrée sur la Petite-Rivière-au-Renard entre 1977 et 1997 s'est produite un 7 juillet et possédait une intensité semblable à une crue centennale.

STANTEC EXPERTS-CONSEILS LTÉE

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² <http://geoportail-geoportal.gc.ca/fra/Maps/Viewer/2#fc>

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END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete forming and accessories
- .2 Section 03 20 00 – Concrete reinforcing
- .3 Section 03 30 00 – Cast-in-place concrete
- .4 Section 31 23 11 – Excavation and backfilling
- .5 Section 32 11 00 – Roadwork

1.2 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)

1.3 INSPECTION

- .1 Allow Ministerial Representative access to all works. If any part of the works is in being executed at locations outside the work site, allow access to such site at any time for the duration.
- .2 Give timely notice requesting inspection if work is designated for special tests, inspections/approvals by Ministerial Representative or if required by local regulations.
- .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 works until inspections or tests satisfactorily have been completed and replace covers.
- .4 The Ministerial Representative may order part of works to be examined if such works are suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, the Contractor shall undertake corrective measures and assume the costs of examination and correction. If such works is found in accordance with Contract Documents, Ministerial Representative shall assume the cost of examination.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Parks Canada Agency (PCA) for purpose of inspecting and/or testing portions of work. Cost of such services will be borne by PCA.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.

- .3 Employment of inspection/testing agencies does not relax responsibility to perform works in accordance with Contract Documents.
- .4 If defects are identified during testing and/or inspections, the designated agency will require further inspection and/or additional testing to define the precise nature and extent of these defects. The Contractor shall correct the defects as directed by the Ministerial Representative, at no additional cost to the Ministerial Representative, and pay the cost of retesting after the corrections are made.

1.5 ACCESS TO WORK

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

1.6 PROCEDURES

- .1 Notify appropriate agency and Ministerial 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 Ministerial 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 the Ministerial Representative determines that it is not expedient to correct defective/non-conforming works, Owner/Applicable Public Authority will deduct from Contract Price the difference in value between work performed and that which has been called for by Contract Documents, the amount of which will be determined by the Ministerial Representative.

1.8 REPORTS

- .1 Submit four (4) copies of inspection and test reports to the Ministerial Representative.
- .2 Provide copies to subcontractor of work 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 Ministerial Representative and may be authorized as recoverable.

1.10 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

Part 1 General

1.1 SECTION CONTENTS

- .1 Construction assistance.
- .2 Trailer offices and locker.

1.2 INSTALLATION AND REMOVAL OF MATERIALS

- .1 Provide, set up or arrange the building site installations necessary for completion of work as soon as possible.
- .2 Site preparation and restoration shall be at the cost of the Contractor.
- .3 Dismount the material and dispose of it off site when they are no longer needed.

1.3 ON SITE STORAGE/ELIGIBLE LOADS

- .1 Make sure that work is carried out within the limits indicated in the contractual documents. Do not restrict the site with materials in an unreasonable manner.
- .2 Do not to overload nor allow overloading any part of work in order to not compromise its integrity.
- .3 In addition to the delineated site, the Contractor may use a portion of Boulevard Cap des Rosiers, between the projected intersection and the existing road (boul. Cap des Rosiers) along the shoreline. The contractor must assure that the storage areas and work zones be properly barricaded such that no pedestrians may access the area by using the boulevard.

1.4 SITE ACCESS & PARKING

- .1 It is permitted to park on the building site as long as such parking does not impede the execution of the work or the traffic flow.
- .2 Arrange suitable access roads to the building site and ensure their maintenance. The Contractor must notably ensure access to both side of Cap-des-Rosiers creek in order to permit the realisation of the monumental works (bridge).
- .3 Prior to construction of access roads, the Contractor must submit to the Ministerial Representative for approval sketches that indicate the trajectory of the access roads and their associated impacts on the surrounding environment.

- .4 The Contractor must ensure at all times an access to the site that is convenient and secure that satisfies the requirements of Parks Canada Agency for use by employees of the PCA and emergency services (Fire, police, ambulance, etc.)
- .5 Should the temporary use of existing roads for access to the site be applicable, the maintenance, regular cleaning, repair of any damage caused by the works shall be undertaken regularly, for the duration of the works and at the request of the Ministerial Representative by the Contractor.

1.5 TRAILER OFFICES

- .1 The Contractor may use the recreation area (picnic) located in front of the port and perception kiosks of the Northern Sector for the installation of his office trailers. The diurnal area will be closed to the public during the works. The Entrepreneur has to and indicate that the picnic area is closed and forbidden to the public. The area shall be restored to its original state at the end of its use.
- .2 Prepare a ventilated office, heated at a temperature of 22 °C, equipped with lighting ensuring a level of illumination of 750 lux and big enough to allow meetings with a capacity of at least 8 people. The office needs table for the spreading of drawings and also the office of the ministerial Representative. The trailer must be supplied with electricity 115/230 volts.
- .3 Provide clearly identify a complete first aid kit, and place it at an easy to reach place.
- .4 If needed, the subcontractors must arrange their own office. Indicate them where they can install themselves.
- .5 Trailer Office of the Ministerial Representative.
 - .1 Arrange a temporary office for the Ministerial Representative.
 - .2 The office must measure, interior wise, at least 5,0 m length X 3,0 m width X 2,4 m height with an adjacent office of at least 3,6 m length equally wide and the same height and with a floor located at 0,3 m above the ground, with also like 4 windows opening 50 % and a lockable door and provide electricity 115/230 volts.
 - .3 The office must be well insulated and be equipped with a heating system and air-conditioning ensuring a room temperature of 22 °C when the outside temperature is -20 °C.
 - .4 The walls and the ceiling must be covered with plywood panels, hard fiberboards or plasterboards, and then painted according to the selected colors. The floor must be covered with plywood panels of 19 mm thickness.

- .5 The office must be equipped with an electric lighting system ensuring a level of illumination of 750 lux; the apparatuses used must be of commercial type, with direct lighting with (10 % of the light upward directed), wall-mounted luminaries, provided with reflectors.
- .6 Furnish the office with a table of 1 m X 2 m, a table of 1,2 m X 2,4 m, 12 chairs, an office chair with casters, of a dustbin, a cool water distributor, shelves of 300 mm width, adding up to 6 m length, a sorter with three drawers, a drawings support and a clothing support with shelf.
- .7 Install a bathroom for the exclusive use of the Ministerial Representative and those of the PCA. The maintenance of such bathroom shall be undertaken by the Contractor.
- .8 The offices of the Ministerial Representative must be equipped with a telephone, fax and internet line for the exclusive use by the Ministerial Representative
- .9 Keep the places clean.

1.6 STORAGE OF THE MATERIALS AND TOOLS

- .1 Provide weatherproof lockers intended for materials and tools storage, and keep the lockers clean and in order.
- .2 Leave on site materials which do not have to be kept with the shelter, but make sure they don't obstruct any work.
- .3 No security shall be provided by the Owner/Applicable Public Authority. The Contractor is responsible for all thefts or damage that may occur on the site.

1.7 SANITARY FACILITIES

- .1 Furnish sanitary facilities for the workmen in accordance with the ordinances and relevant regulations.
- .2 Post the required notices and take all precautions required local health authorities. Keep the places and the sector clean.

1.8 TRAILER OFFICES ELECTRICITY

- .1 The electrical supply is planned into the electric panel no 1 located in the electric room of the building "center of interpretation" and it is at a distance of ± 175 meters of the diurnal area. The entrepreneur has to plan in his costs the installation and the removal of a temporary aerial electricity network between the offices of the construction site and the point of power supply, by including the temporary posts and insure a safe vertical clearance with the ground, the addition of circuit breakers into the existing electrical panel of the center of interpretation, the drilling and

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the restoration of the wall of the electric room for the passage of electric cables and all other works required to allow to feed the offices(trailers) of the construction site. The Contractor must provide and install all required material for the connection. The energy expenses will be charged to the entrepreneur by basing itself on the average consumption of the last two years applicable to the period of use of the temporary electricity network. The location of the center of interpretation and a photography of the electrical panel no 1 are shown in following articles

.2 Localisation plan



.3 Photo – Electrical panel interpretation center



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 03 10 00 – Concrete forming and accessories
- .2 Section 03 20 00 – Concrete reinforcing
- .3 Section 03 30 00 – Cast-in-place concrete

1.2 REFERENCES

- .1 If there is question as to whether products or systems are in conformance with applicable standards, the Ministerial Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .2 Cost for such testing will be borne by the Ministerial 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 the Ministerial 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.

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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 the Ministerial Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify the Ministerial Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Ministerial 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 the Ministerial Representative.
- .9 Touch-up damaged factory finished surfaces to Ministerial Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates. It is prohibited to apply a finishing or a touch-up product on the nameplates.

1.6 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.

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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 the Ministerial Representative in writing, of conflicts between specifications and manufacturer's instructions, so that he will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Ministerial 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 the Ministerial 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. Ministerial 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 Ministerial Representative, whose decision is final.

1.9 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

1.10 EMISSION OF DOCUMENTS

- .1 Before Emitting documents, inform Ministerial Representative if any anomaly is detected. Install as directed by the Ministerial Representative.

1.11 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 such a manner to neither damage nor put at risk any portion of work.

1.12 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.

1.13 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Bolts may not project more than one diameter beyond nuts.
- .3 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities of the respective companies, 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 of the respective companies having jurisdiction. Stake and record location of capped service.

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 SUBMITTALS

- .1 Submit to the Ministerial Representative copies of the following documents, including updates issued:
 - .1 Health and Safety Program as indicated in paragraph 1.9, prior to commencement of work on the work site.
 - .2 Reports or directions issued by authorities having jurisdiction, immediately upon issuance from that authority.
 - .3 Accident or Incident Reports, within 24 hrs of occurrence.
- .2 Submit other data, information and documentation upon request by the Ministerial Representative as stipulated elsewhere in this section.

1.2 COMPLIANCE REQUIREMENTS

- .1 Comply with the latest edition of the Quebec Occupational Health and Safety Act, and the Regulations made pursuant to the Act.
- .2 Observe and enforce construction safety measures required by:
 - .1 Ministère des Transports - Quebec Safety Code – Volume V – Traffic Control Devices
 - .2 Provincial Highway Safety Code.
 - .3 Provincial Worker's Compensation Board (CSST)
 - .4 Municipal statutes and ordinances.
- .3 In event of conflict between any provisions of above authorities the most stringent provision shall apply.
- .4 Provide and maintain Worker's Compensation Board coverage for all employees for the duration of the contract. Prior to commencement of the work, at the time of Interim Completion and prior to final payment, provide to the Ministerial Representative) a letter (certificate) of Clearance from the Workers' Compensation Board (or equivalent organism) indicating that the Contractor's account is in good standing.
 - .1 Should the Contractor be a sole proprietor, provide documented proof in a form acceptable to the Ministerial Representative of an alternative means of personal coverage that meets or exceeds the

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requirements set out above for Worker's Compensation Board coverage.

1.3 RESPONSIBILITY

- .1 The Contractor is responsible for safety of persons and property on the work site and for protection of federal employees and the general public circulating adjacent to work site operations to extent that they may be affected by conduct of work.
- .2 The Contractor is to enforce compliance by workers and other persons granted access to work site with safety requirements of Contract Documents, applicable federal, provincial, and local statues, regulations, and ordinances, and with the Contractor's Health and Safety Program.
- .3 Should an unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise the Ministerial Representative verbally and in writing of the hazard or condition.

1.4 SITE CONTROL AND ACCESS

- .1 Control all work site access points and work site activities. Delineate and isolate the work site from adjacent and surrounding areas by use of appropriate means to maintain control of all work site access points.
- .2 Make provisions for granting permission to access onto work site to all persons who require access. Procedures for granting permission to access are to be in accordance with the Quebec Occupational Health and Safety Act, and the Regulations made pursuant to the Act and the Contractor's Health and Safety Program.
- .3 Ensure persons granted access to the work site are in possession of and wear the minimum personal protective equipment (PPE) designated by the Contractor's Health and Safety Program. Ensure persons granted access to the work site are provided with, trained in the use of, and wear, appropriate PPE that are required above and beyond the designated minimums previously noted and as specifically related to the work site activity that they are involved in. Be responsible for the efficacy of the PPE that is provided above and beyond the designated minimums.
- .4 Erect signage at access points and at other strategic locations around the work site clearly identifying the work site area(s) as being "off-limits" to non-authorized persons. Signage must be professionally made with well

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understood graphic symbols and is not to be used as advertising but for the specific use as related to site safety and key contact information.

.1 Information to be provided on the signage is as follows:

- .1 Project Name/Description:
- .2 Contractor Company Name:
- .3 Project Superintendent's Name/Phone No.:

.5 Secure the work site at all times to protect against un-authorized access.

1.5 FILING OF NOTICE

- .1 File Notice of Project and any other required Notices with the Provincial Authorities prior to commencement of the work. Provide the Ministerial Representative) with a copy of the filed Notice(s) prior to commencement of the work.

1.6 PERMITS

- .1 Obtain permits, licenses and compliance certificates at appropriate times and frequencies as required by the authorities having jurisdiction.
- .2 Post all permits, licenses and compliance certificates on work site and provide copies to the Ministerial Representative.

1.7 HEALTH AND SAFETY PROGRAM

- .1 Contractors are required under Québec Occupational Health and Safety Act, and the Regulations made pursuant to the Act to have in place a Health and Safety Program. Compliance requirements for the content, detail and implementation of the program resides with the provincial/territorial authority. For the purpose of this contract the Health and Safety Program shall include a site-specific Health and Safety Plan that acknowledges, assesses and addresses the hazardous substances and/or hazardous conditions known and identified and on-going hazard assessments performed during the progress of work identifying and documenting new or potential health risks and safety hazards not previously known and identified.
- .2 Provide one copy of the Health and Safety Program to the Ministerial Representative prior to commencement of work on the work site. The copy provided to the Ministerial Representative is for the purpose of review against the contract requirements related to the known hazardous substances and/or hazardous conditions. The review is not to be construed to imply

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approval by the Ministerial Representative that the program is complete, accurate and legislatively compliant with the Québec Occupational Health and Safety Act, and the Regulations made pursuant to the Act, and shall not relieve the Contractor of their legal obligations under such legislation.

1.8 ACCIDENT REPORTING

- .1 Investigate and report incidents and accidents as required by Quebec Occupational Safety and Health Act, and the Regulations made pursuant to the Act.
- .2 For the purpose of this contract immediately investigate and provide a report to the Ministerial Representative on incidents and accidents that involve:
 - .1 A resulting injury that may or may not require medical aid but involves lost time at work by the injured person(s),
 - .2 Exposure to toxic chemicals or substances,
 - .3 Property damage,
 - .4 Interruption to adjacent and/or integral infrastructure operations with potential loss implications.
- .3 In the investigation and reporting of incidents and accidents, the Contractor is required to respond in a timely fashion to correct the action that was deemed to have caused the incident and/or accident and to advise in writing on the action taken to prevent a re-occurrence of the incident and/or accident.

1.9 RECORDS ON SITE

- .1 Maintain on site a copy of the safety documentation as specified in this section and any other safety related reports and documents issued to or received from the authorities having jurisdiction.
- .2 Upon request, make copies available to the Ministerial Representative.

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 31 23 11 – Excavation and backfilling
- .2 Section 32 11 00 – Roadwork

1.2 QUALIFICATIONS OF SURVEYOR

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

1.3 SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points are designated on drawings.
- .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Ministerial Representative.
- .4 Report to Ministerial Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey.

1.4 SURVEY REQUIREMENTS

- .1 For each element of the foundation where works are required, establish one (1) permanent bench mark 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.
- .5 Install guide chairs for the foundations
- .6 Establish level of foundations as well as the placement bearing elements.

1.5 EXISTING SERVICES

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

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

1.6 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.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work.

1.8 SUBSURFACE CONDITIONS

- .1 Promptly notify Ministerial 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 Ministerial 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

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain work site in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner/Applicable Public Authority or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Ministerial Representative. Do not burn waste materials on site, unless approved by the Ministerial Representative.
- .3 Contractor shall submit to the Ministerial Representative proofs (bills, notes or any other evidence acceptable to the Ministerial Representative) on the disposal of the different kinds of waste.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling.
- .7 Dispose of waste materials and debris off site.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris 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 other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Ministerial Representative. Do not burn waste materials on site, unless approved by the Ministerial Representative.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures

1.2 SECTION CONTENTS

- .1 Project file, samples and specifications;
- .2 Shop drawings;
- .3 Annotated plans, consistent with execution;
- .4 Technical sheets, materials, equipment and finishing products, and related information;
- .5 Materials/equipment replacement, special tools and spare parts;
- .6 Guarantees and sureties of site by Parks Canada Agency (PCA).

1.3 SUBMITTALS

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copies will be returned after final inspection, with Ministerial Representative comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to Ministerial Representative two final copies of requested documents in French.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 Furnish evidence, if requested, for type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replacement of products will be at the Contractor's expense.
- .8 Assume costs of transportation.
- .9 The Contractor supplies all documents to be submitted at the end of works in PDF file format.

1.4 FORMAT

- .1 Organize data as instructional manual.

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- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide CAD files on scale 1:1 on dwg format on CD.

1.5 CONTENTS – EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names, addresses, and telephone numbers of the Ministerial Representative and Contractor with name of responsible parties.
 - .2 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 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.6 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for the Ministerial Representative one record copy of:
 - .1 Contract Drawings,

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- .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 and Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
 - .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
 - .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes. Keep record documents and samples available for inspection by the Ministerial Representative.

1.7 RECORDING SITE CONDITIONS

- .1 Record information on two (2) sets of black line opaque drawings, and one (1) in copy of Project Manual.
- .2 Provide felt tip marking pens, maintaining separate colors for each major system, for recording information. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .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.

1.8 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Remove damaged or destroyed products and replace them at no additional cost to the satisfaction of the Ministerial Representative.

1.9 WARRANTIES

- .1 The warranty shall be worded as follows: Parks Canada Agency.
- .2 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing. All warranties should be found in the operation and

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maintenance manual. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

- .3 Except for items put into use with the Ministerial Representative permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .4 Make sure that the documents are in good and due form, they contain all the necessary information.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 70 12 – Safety Requirements
- .2 Section 01 33 00 – Submittal Procedures

1.2 REFERENCES

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
 - .1 Export and Import of Hazardous Waste Regulations (SOR/2002-300)
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS)
- .3 National Fire Code of Canada 2010
- .4 Transportation of Dangerous Goods Act (TDG Act) 1999, (c. 34)
- .5 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2003-400)

1.3 DEFINITIONS

- .1 Dangerous Goods: product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .3 Hazardous Waste: any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .4 Workplace Hazardous Materials Information System (WHMIS): Canada-wide system designed to give employers and workers information about hazardous materials used in workplace. Under WHMIS, information on hazardous materials is provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

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- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit to Ministerial Representative current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on site.
 - .2 Submit hazardous materials management plan to Ministerial Representative that identifies hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Co-ordinate storage of hazardous materials with Ministerial Representative and comply with internal requirements for labelling and storage of materials and wastes.
- .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.
- .4 Keep no more than 45 L of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 L for work purposes requires the approval of the Ministerial Representative.
- .5 It is forbidden to transfer of flammable and combustible liquids in vicinity of open flames or heat-producing devices.
- .6 Do not use flammable liquids having flash point below 38 °C, such as naphtha or gasoline as solvents or cleaning agents.
- .7 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
- .8 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
- .9 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 L for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers,

- .2 Label containers of hazardous materials and wastes in accordance with WHMIS,
- .3 Store hazardous materials and wastes in containers compatible with that material or waste,
- .4 Segregate incompatible materials and wastes,
- .5 Ensure that different hazardous materials or hazardous wastes are not mixed,
- .6 Store hazardous materials and wastes in secure storage area with controlled access,
- .7 Maintain clear egress from storage area,
- .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment,
- .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
- .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
- .10 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .11 Report spills or accidents immediately to Ministerial Representative. Submit a written spill report to Ministerial Representative within 24 hours of incident.

1.6 TRANSPORTATION

- .1 Transport hazardous materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .2 If exporting hazardous waste to another country, ensure compliance with federal Export and Import of Hazardous Waste Regulations.
- .3 If hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Ministerial Representative.
 - .2 Ensure compliance with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Prior to shipping material obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.
 - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.

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- .6 Ensure that trained personnel handle, offer for transport, or transport dangerous goods.
- .7 Provide photocopy of shipping documents and waste manifests to Ministerial Representative.
- .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to Ministerial Representative.
- .9 Report discharge, emission, or escape of hazardous materials immediately to Ministerial Representative and appropriate provincial authority. Take reasonable measures to control release.

Part 2 Products

2.1 MATERIALS

- .1 Only bring on site quantity of hazardous materials required to perform work.
- .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

Part 3 Execution

3.1 DISPOSAL

- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
- .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
- .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.
 - .3 Lead-acid battery recycling.
 - .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

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Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00 – Concrete Reinforcing
- .2 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-O86-09, Engineering Design in Wood.
 - .3 CSA O121-08 (R2013), Douglas Fir Plywood.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CSA O153-13, Poplar Plywood.
 - .6 CAN/CSA-O325-07 (R2012), Construction Sheathing.
 - .7 CSA O437 Series-93 (R2011), Standards for OSB and Waferboard.
 - .8 CSA S269.1-1975 (R1998), Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3-M92 (R2008), Concrete Formwork, National Standard of Canada.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, most recent version.
 - .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 ACTION AND INFORMATIONAL SUBMITTALS

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

- .1 Submit shop drawings for formwork and falsework in accordance with Art. 15.4.3.1 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, most recent version.
- .2 Submit required Material Safety Data Sheets (MSDS), in accordance with the Workplace Hazardous Materials Information System (WHMIS) and according to Section 01 35 29 – Health and Safety Requirements and Section 01 35 43 – Environmental Procedures.
- .3 Shop drawings must indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, special architectural exposed finishes, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.
- .4 Provide shop drawings including formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .5 Provide sequence of erection and removal of formwork/falsework as directed by the Departmental Representative.

1.4 TRANSPORTATION, STORAGE AND HANDLING

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

Partie 2 Products

2.1 MATERIALS

- .1 Formwork materials
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, latest edition.
 - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
 - .3 As an alternative to adjustable saddles, Borg adjustable hangers from the Valor Inc. company may be used with formworks for slabs on steel girders above 1,000 mm in height. Formwork hangers must remain accessible via bridging underneath the formworks so as to be adjustable when de empty equipment passing. The use of these hangers must not entail raising the bridge's profile and cannot modify the quantities outlined in the bid. Use of this hanger type is prohibited for concrete girders and cantilever formwork. Hangers must not damage girder surfaces, and holes left after the removal of hangers must be filled with mortar during the surface correction stage.
- .2 Form ties
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface..
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
 - .3 Comply with Art. 15.4.3.1.3 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, most recent version.
- .3 Form release agent: non-toxic, biodegradable, low VOC.
- .4 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm²/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .5 Falsework materials: to CSA-S269.1, latest version.
- .6 As an alternative to adjustable saddles, Borg adjustable hangers from the Valor Inc. company may be used with formworks for slabs on steel girders above 1,000 mm in height. Formwork hangers must remain accessible via bridging underneath the formworks so as to be adjustable when de empty equipment passing. The use of these hangers must not entail raising

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the bridge's profile and cannot modify the quantities outlined in the bid. Use of this hanger type is prohibited for concrete girders and cantilever formwork. Hangers must not damage girder surfaces, and holes left after the removal of hangers must be filled with mortar during the surface correction stage.

Partie 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1, latest edition.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2 and Art. 15.4.3.1 and 15.4.3.5.6 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, latest edition.
- .8 As an alternative to adjustable saddles, Borg adjustable hangers from the Valor Inc. company may be used with formworks for slabs on steel girders above 1,000 mm in height. Formwork hangers must remain accessible via bridging underneath the formworks so as to be adjustable when de empty equipment passing. The use of these hangers must not entail raising the bridge's profile and cannot modify the quantities outlined in the bid. Use of this hanger type is prohibited for concrete girders and cantilever formwork. Hangers must not damage girder surfaces, and holes left after the removal of hangers must be filled with mortar during the surface correction stage.
- .9 When curb formworks are attached to the concrete on top of a new slab using nails, these must be secured by drilling. It is prohibited to use a detonating or impact tool in order to insert nails. Nails must be removed from the slab after use and holes must be filled with cement grout by using a straw or other appropriate tool.

- .10 Formwork accessories: In accordance with Art. 15.4.3.1.3 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, most recent version.
- .11 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .12 Unless otherwise specified, use 15 mm chamfer strips for sharp edges and/or rods of 15 mm for the re-entrant corners of formwork joints.
- .13 Grooves, slots, openings, drip edges, re-entrants, and expansion and contraction joints must comply with specifications.
- .14 Formworks must accommodate the construction joints specified in the plans.
- .15 Embed anchors, sleeves, and other embedded items required for the works specified in other sections.
 - .1 Ensure that anchors and embeds do not protrude from surfaces to be coated with a finishing product, a coat of paint for example.
- .16 Coat the inside of the formwork with a commercially available form removal agent designed to prevent the adhesion of concrete.
- .17 Brush forms before their installation according to the application rate specified in the data sheet of the product to be used. The form removal agent should not come in contact with the reinforcement.
- .18 Determine the elevation of the concrete pour by the top of formwork or by molding.
- .19 Before pouring the concrete, clean formwork in accordance with CSA standard A23.1/A23.2, latest edition.
 - .1 For cleaning formwork, use a compressed air jet, a jet of pressurized water, or a vacuum to remove any ice, snow, debris, or other foreign matter.
 - .2 The air jet must be equipped with a filter that removes oil. Demonstrate the effectiveness of the filter before use.
 - .3 Use mixing water for concrete in accordance with CSA standard A23.1/A23.2, latest edition, for cleaning formwork.

3.2 REMOVAL AND RESHORING

- .1 After pouring the concrete, leave the formwork in place for at least the minimum period as indicated by the CCDG, article 15.4.3.1.6.
- .2 Remove formwork when concrete has reached 70% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

- .3 The formwork shall be considered removed once it has been loosened and a part of it is no longer in contact with the concrete.
- .4 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66, ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A82/A82M, latest edition, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A143/A143M, latest edition, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .3 ASTM A123/A123M, latest edition, Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.
 - .4 ASTM A767, Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
 - .5 ASTM A185/A185M, latest edition, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .3 CSA International
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3, Design of Concrete Structures, latest edition.
 - .3 CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement, latest edition.
 - .4 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, latest edition.
 - .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles Metals and Metal Products, latest edition.
 - .6 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction, latest edition.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC, Reinforcing Steel Manual of Standard Practice, latest edition.

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- .5 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, most recent version.
 - .2 *Ouvrages routiers, Normes, Tome VII – Matériaux, norme 5101, Renforcements pour les ouvrages de béton*, most recent version.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop drawings
 - .1 Submit drawings stamped and signed by professional engineer, member in good standing with the Ordre des ingénieurs du Québec (OIQ).
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Reinforcement list.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .4 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by the Departmental Representative prior to its use.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance:
 - .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, a minimum of two (2) weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

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1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 off ground, indoors, in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Work Plan related to Work of this Section.

Partie 2 Products

2.1 MATERIALS

- .1 Ensure the reinforcing steel is free of dirt, earth, rust, oil, and hardened concrete spatter from a previous concrete pour.
- .2 Ensure that the reinforcing steel bars to be used are not bent or twisted.
- .3 Any replacement of reinforcing steel by different sized bars must be authorized in writing by the Departmental Representative
- .4 Reinforcing steel: billet steel, grade 400W, deformed bars to CSA-G30.18, unless otherwise indicated.
- .5 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .6 Cold-drawn annealed steel.
- .7 Wire ties: to ASTM standard A82/A82M.
- .8 Reinforcement wire: High-adherence reinforcement wire as per standard A82/A82M.
- .9 Tie wire and reinforcement wire must have a diameter of at least 1.6 mm (16 gauge). The steel wire used with the galvanized reinforcement must be galvanized.
- .10 Welded steel wire fabric: to ASTM A185/A185M.
 - .1 Provide in flat sheets only.
- .11 High-adherence reinforcement wire mesh: the mesh must be high-adherence welded steel wire mesh as per standard ASTM A82/A82M.

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- .1 Provide in flat sheets only.
- .12 Galvanizing of non-prestressed reinforcement: minimum galvanization of 87 µm according to ASTM A767, Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete reinforcement. Chromate treatment not required.
- .13 Mechanical splices: subject to approval of the Departmental Representative.
- .14 Plain round bars: to CSA-G40.20/G40.21.
- .15 Spacers must conform to the requirements of *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, most recent version.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and with the Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
- .5 Apply tolerances for length and bending of reinforcing steel as specified in Figure 6.1 of the RSIC Reinforcing Steel Manual of Standard Practice.
- .6 Unless otherwise indicated on the drawings and specifications, apply a minimum length of 600 mm overlap between interconnecting bars following work carried out in several distinct phases.

Partie 3 Execution

3.1 PREPARATION

- .1 Galvanization of reinforcing bars must conform to standard ASTM A123/123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .1 In the case of reinforcing bars, the galvanization must conform to standard ASTM A767, Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement. Chromate treatment not required. Minimum galvanization of 87 µm.

- .2 In the case of formwork connectors and ties, a minimum galvanization of 50 µm.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M:
 - .1 In the case of flexible galvanized bars, with the exception of spiral reinforcements, bending must be carried out after galvanization, while cutting may be done before or after galvanization. After bending, the complete flaking surface to the right of the bending radius must not exceed the cross-section of the bent bars; any bars with a flaking surface greater than that value will be rejected.
- .3 When straight bars are to be galvanized, if the cutting of bars occurs after galvanization, the cut bar ends must be coated in-plant with two layers of a zinc-rich sealant applied with a brush. The zinc-rich sealant must contain a minimum of 87% metallic zinc in the dry paint film.

3.2 FIELD BENDING

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

3.3 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CAN/CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Secure reinforcing steel using steel wire ties to prevent movement during the pouring of concrete:
 - .1 Attach firmly the reinforcing steel at intersections if these intersections are 300 mm or more away or at every two (2) intersections if distance is lesser.
 - .2 To link the reinforcing steel, use annealed steel wire with a diameter of at least 1.6 mm (16 gauge).
 - .3 To link the reinforcing steel, use annealed steel wire.
 - .4 Fold wires to obtain the same cover as required for reinforcement.

- .5 Replace existing reinforcing steel whose ties have been altered during the demolition works in their original position.
 - .1 Attach the reinforcement to each formwork tie in order to meet the required concrete cover.
- .6 Use plastic spacers spaced at a maximum distance of 1,200 mm from center to center, to maintain the reinforcing steel at the required distance from the forms, the ground, or the existing concrete:
 1. Use circular plastic spacers whose center is fixed to the reinforcing steel for holding in position the reinforcing steel grids comprising 15 M and 20 M bars.
 2. Use plastic spacers to maintain upright the reinforcing steel grids comprising bars sized 25 M or larger.
 3. Use continuous wedges with plastic coated wire and coated plastic tabs to keep horizontal the reinforcing steel grid which is closest to the formwork, the ground, or the existing concrete.
 4. In the case of slabs on girders, continuous spacers made entirely of plastic are allowed.
 5. In the case of footings and inverts, tiles to be used must conform with MTQ Standard 3402.
 6. Unless otherwise indicated in the drawings and specifications, use individual plastic spacers for the horizontal reinforcing steel.
 7. Following the reinforcement of footings, a new deck, or a new slab, and prior to concreting:
 - .1 The Contractor must submit to the Supervisor a written notice from an engineer, member in good standing with the Ordre des ingénieurs du Québec (OIQ), indicating that the reinforcement and anchor rods are installed in accordance with plan and specification requirements related to the steelworks source, steel grade and protection type, diameter, length, location and covering for each of the bars, as well as for the spacing of fasteners; this notice must also mention the inspection date and time. In the case of vertical elements, particularly an abutment, the notice must be issued prior to formwork installation on the last main face of each element part. The Contractor must draft the notice and have it signed by the engineer who carried out the inspection at the reinforcement placement site.

3.4 FIELD TOUCH-UP

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

3.5 CLEANING

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

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcing

1.2 REFERENCES

- .1 Abbreviations and Acronyms
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (b suffix - b denotes blended) and Portland-limestone cement).
 - .1 Type GU, GUb and GUL: General use cement.
 - .2 Type MS and MSb: Moderate sulphate-resistant cement.
 - .3 Type MH, MHb and MHL: Moderate heat of hydration cement.
 - .4 Type HE, HEb and HEL: High early-strength cement.
 - .5 Type LH, LHb and LHL: Low heat of hydration cement.
 - .6 Type HS and HSb: High sulphate-resistant cement.
 - .2 Fly ash
 - .1 Type F: with CaO content less than 8%.
 - .2 Type CI: with CaO content ranging from 8 to 20%.
 - .3 Type CH: with CaO greater than 20%.
 - .3 GGBFS: Ground, granulated blast-furnace slag.
- .2 References
 - .1 ASTM International
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .5 ASTM D412-06a (2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

- .6 ASTM D624-00 (2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .7 American Association of State Highway and Transportation Officials.
- .8 ASSHTO M154, Standard Specification for Air-Entraining Admixtures for Concrete.
- .9 ASSHTO M194, Standard Specification for Chemical Admixtures for Concrete.
- .10 ASSHTO T260, Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.
- .11 ASTM C295/C295M, Guide for Petrographic Examination of Aggregates for Concrete.
- .12 ASTM C457/C457M, Standard Test Method for Microscopical Determination of Parameters on the Air-Void System in Hardened Concrete.
- .13 ASTM C666/C666M, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- .14 ASTM C1202, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.
- .15 ASTM D1751-04 (2008), Standard Specification for Preformed Expansion Joint Filer for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .16 ASTM D1752-04a (2008), Standard Specification for Preformed Sponge Cork and Recycled PVC Expansion Joint Filer for Concrete Paving and Structural Construction.
- .2 CSA International
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000-08, Cementitious Materials Compendium (consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CAN/CSA S6, Canadian Highway Bridge Design Code.
- .3 Quebec Ministry of Transportation (MTQ):
 - .1 *Liste des matériaux relatifs au béton éprouvés par le laboratoire des chaussées*, latest edition.
 - .2 *Cahier des charges et devis généraux, Infrastructures routières, Construction et réparation*, latest edition.

- .3 *Normes Ouvrages routiers, Tome VII, Matériaux.*
- .4 Quebec Standards Office (BNQ)
 - .1 BNQ 2621-905, *Béton prêt à l'emploi – Programme de certification* (based on requirements of Chapters 4, 5 and 8 of CSA A23.1-F09/ F09-A23.2 standards).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 – Construction Progress Schedules – Bar (GANTT) Chart, convene pre-installation meeting one week prior to beginning concrete works).
 - .1 The Departmental Representative and a representative of the testing laboratory must be present.
- .2 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Provide testing inspection results reports for review by the Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 – FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.
- .2 Provide the Departmental Representative, minimum two (2) weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by the Departmental Representative on following items.
 - .1 Temporary shoring erection.

- .2 Hot weather concreting.
- .3 Cold weather concreting
- .4 Curing.
- .5 Finishing.
- .6 Form removal.
- .7 Joints.
- .4 Quality Control Plan: provide written report to the Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .5 Contractor to perform V-S and XIII type concrete suitability test. Suitability test to be performed in accordance with Art. 15.4.2.1.4 d) du *Cahier des charges et devis généraux, Infrastructures routières, Construction et réparation*, most recent version.

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

1.7 SITE CONDITIONS

- .1 Place concrete while complying with the temperature limits in CAN/CSA-A23.1/A23.2 and MTQ standard 3101.
- .2 Do not place concrete:
 - .1 When the air temperature is above 22°C.
 - .2 In the presence of rain or excessive wind or dust.
 - .3 If the conditions, in the opinion of the Departmental Representative, seem harmful to concrete.

- .3 Comply with cold weather requirements when the air temperature drops below 5°C.
- .4 Maximum temperature during curing of cast-in-place concrete must not exceed 70°C.

Partie 2 Products

2.1 DESIGN CRITERIA

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

2.2 PERFORMANCE CRITERIA

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

2.3 MATERIALS

- .1 Concrete: to MTQ Standard 3101.
- .2 When using a polycarboxyate-based superplasticizer between May 15 and September 15 for the concreting of new bridge elements (including piers, supports and abutments), decks or slabs, the initial curing time must be no less than six (6) hours.
- .3 Curing material: To MTQ Standard 3501.
- .4 Cement mortar in bags must comply with MTQ Standard 3801.
- .5 Water: to CAN/CSA A23.1.
- .6 Curing products: to CAN/CSA A23.1/A23.2.
- .7 Water used for curing concrete must comply with MTQ Standard 3101 for mixing water. Water temperature must not be lower than 10°C.
- .8 When indicated on drawings, compressible inserts must comply with ASTM D1751 or ASTM D1752.
- .9 In case of difficulty in obtaining ternary cement, GUB-SF type cement can be used in its place.

2.4 MIXES

- .1 Performance Method for specifying concrete performance criteria to CSA A23.1/A23.2 and to MTQ Standard 3101.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

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- .2 Provide concrete mix to meet following plastic state requirements.
 - .1 Workability: free of surface blemishes.
- .3 Provide concrete mix to meet following hard state requirements.
 - .1 Compressive strength at 28 days: 35 MPa minimum.
 - .2 Aggregate size: See MTQ standard 3101.
 - .3 Pre-Qualification: air-entraining agent, slump, and temperature results based on the previous use of the proposed mixture.
- .4 Provide quality management plan to ensure verification of concrete quality to specified performance.
- .5 Certification of concrete supplier: concrete mixing plant and materials must comply with CAN/CSA A23.1.

Partie 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Provide for construction joints as specified on drawings. Horizontal joints to be level, even and marked off by a rod to ensure a straight line. To obtain a smooth surface, hardened construction joint concrete surfaces must be sandblasted (15 MPa, rate of 20 l/min, concentrated circular spray nozzle, nozzle-concrete surface distance between 150 and 200 mm) prior to placing concrete.
- .5 Construction joints not shown on drawings must be approved by the Departmental Representative and must comply with his instructions.
- .6 Pumping of concrete will not be permitted is permitted only after approval of equipment and mix.
- .7 Ensure reinforcement and inserts are not disturbed during concrete placement.

- .8 Prior to placing of concrete obtain Departmental Representative 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 Departmental Representative.
- .13 Immediately before placing concrete, properly water the substrate with clean water.
- .14 Contractor to perform V-S and XIII type concrete suitability test. Suitability test to be performed in accordance with Art. 15.4.2.1.4 d) of *Cahier des charges et devis généraux, Infrastructures routières, Construction et réparation*, most recent version.

3.2 INSTALLATION

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

- .2 When installing anchor bolts in expansion joints with sliding or rolling bearing devices, ambient temperature must be taken into account.
- .4 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.
- .5 Concrete vibration must comply with Art. 15.4.3.5.7 of *Cahier des charges et devis généraux, Infrastructures routières, Construction et réparation*, most recent version.
- .6 Finish concrete surfaces to Art. 15.4.3.5.8 of *Cahier des charges et devis généraux, Infrastructures routières, Construction et réparation*, most recent version.
- .7 Form isolation construction expansion joints as indicated.

3.3 SURFACE TOLERANCE

- .1 Ensure that surfaces are smooth and even.

3.4 PROTECTION

- .1 Protection and curing of placed concrete must be done in accordance with the following requirements in addition to the requirements of the cold weather CAN/CSA-A23.1/A23.2 standard. For cold weather protection, Contractor to comply with requirements of Art. 15.4.3.8 of *Cahier des charges et devis généraux, Infrastructures routières, Construction et réparation*, most recent version.
 - .1 Keep concrete surfaces continuously wet and protected. Cure concrete for a minimum of seven (7) days.
 - .2 For all concrete types used in new slabs, walls and abutments, with the exception of footings, approach slabs and single-gasket deck joints, curing must extend beyond the minimum 7-day period until concrete has reached 70% f'c as verified by test samples that have been cured under the same conditions as concrete used in Work.
 - .3 Provide misting equipment to allow curing with spray mist before the start of the bridge deck installation.
- .2 Curing method
 - .1 Dampened absorbing tarps
 - .1 Install synthetic fibre tarps and dampen with water. Cover with waterproof sheets to keep concrete surface damp.

- .2 Completely cover all surfaces. Tarps must be kept continuously wet to maintain a thin layer of water on concrete surfaces throughout curing period.
- .3 Temperature of water used for curing must not be lower than 10°C.
- .4 Maximum temperature during curing of cast-in-place concrete must not exceed 70°C.

3.5 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by the Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and the Departmental Representative.
- .4 The testing laboratory will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

3.6 CLEANING

- .1 Clean in accordance with the section 01 74 11 - Cleaning.
- .2 Waste Management
 - .1 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .2 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Departmental Representative.

- .3 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
- .4 Prevent admixtures and additive materials from entering drinking water supplies or streams.
- .5 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
- .6 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcements
- .3 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

- .1 Abbreviations and Acronyms
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (b suffix - b denotes blended).
 - .1 Type GU, GUb and GUL: General use cement.
 - .2 Type MS and MSb: Moderate sulphate-resistant cement.
 - .3 Type MH, MHb and MHL: Moderate heat of hydration cement.
 - .4 Type HE, HEb and HEL: High early-strength cement.
 - .5 Type LH, LHb and LHL: Low heat of hydration cement.
 - .6 Type HS and HSb: High sulphate-resistant cement.
 - .2 Fly ash
 - .1 Type F: with CaO content less than 8%.
 - .2 Type CI: with CaO content ranging from 8 to 20%.
 - .3 Type CH: with CaO greater than 20%.
 - .3 GGBFS: Ground, granulated blast-furnace slag.
- .2 References
 - .1 ASTM International
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .5 ASTM D412-06a (2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

- .6 ASTM D624-00 (2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .7 American Association of State Highway and Transportation Officials
- .8 ASSHTO M154, Standard Specification for Air-Entraining Admixtures for Concrete.
- .9 ASSHTO M194, Standard Specification for Chemical Admixtures for Concrete
- .10 ASSHTO T260, Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials
- .11 ASTM C295/C295M, Guide for Petrographic Examination of Aggregates for Concrete.
- .12 ASTM C457/C457M, Standard Test Method for Microscopical Determination of Parameters on the Air-Void System in Hardened Concrete
- .13 ASTM C666/C666M, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- .14 ASTM C1202, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- .2 CSA International
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories.
 - .3 CSA-A3000-03, Cementitious Materials Compendium (consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CAN / CSA S6, Canadian Highway Bridge Design Code.
- .3 Quebec Ministry of Transportation (MTQ):
 - .1 *Liste des matériaux relatifs au béton éprouvés par le laboratoire des chaussées*, latest edition.
 - .2 *Cahier des charges et devis généraux (CCDG), Infrastructures routières, Construction et réparation*, latest edition.
 - .3 *Normes Ouvrages routiers, Volume VII, Matériaux*.
- .4 Quebec Standards Office (BNQ)
 - .1 BNQ 2621-905, *Béton prêt à l'emploi – Programme de certification* (based on requirements of Chapters 4, 5 and 8 of CSA A23.1-F09/ F09-A23.2 standards).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 The Departmental Representative and a representative of the testing laboratory must be present.
- .2 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide testing inspection results reports for review by the Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 FIELD QUALITY CONTROL – CONTROL SLAB

- .1 Quality assurance: In accordance with Section 01 45 00 – Quality Assurance.
- .2 Provide the Departmental Representative, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items.
 - .1 Temporary shoring erection.
 - .2 Hot weather concreting.
 - .3 Cold weather concreting.
 - .4 Curing.
 - .5 Finishing.

- .6 Form removal.
- .7 Joints.
- .4 Quality Control Plan: provide written report to the Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert unused plasticizers, water reducers and air entrainers from landfill to official hazardous material collections website as approved by the Departmental Representative.
- .4 Emptying plasticizers, water reducers and unused air entrainers into drains, watercourses or lakes, or onto the ground or any other location where they may pose a health or environmental hazard is prohibited.

Partie 2 Products

2.1 MATERIALS

- .1 Concrete components and mix proportions: to Section 03 30 00 – Cast-in-Place Concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 When finishing a concrete slab using a self-propelled finisher, the Contractor shall comply with Sections 15.4.3.5.6 and 15.4.3.5.8 of the latest edition of the CCDG, *Infrastructures routières, Construction et réparation*.

Partie 3 Execution

3.1 PREPARATION

- .1 See Article 3.1 in Section 03 30 00.
- .2 When adjusting formwork, running rails, the self-propelled finisher and the beam vibrator, and for concrete work:
 - .1 The Contractor shall comply with Section 15.4.3.5.6 of the latest edition of the CCDG, *Infrastructures routières, Construction et réparation*.

3.2 CONCRETE PLACING

- .1 Execute concrete work to Section 03 30 00 - Cast-in-Place Concrete.
- .2 Proceed with the pouring of concrete in compliance with the temperature limits set out in the CSA-A23.1/A23.2 and 3101 MTQ standards.
- .3 Proceed with the pouring of concrete in accordance with Sections 15.4.3.5.6 to 15.4.3.5.8 of the latest edition of the CCDG, *Infrastructures routières, Construction et réparation*.
- .4 Do not proceed with the pouring of concrete in the following conditions:
 - .1 When air temperature is above 22 °C;
 - .2 When it is raining, there is strong wind or excessive dust;
 - .3 When the conditions, according to the Departmental Representative, are unfavourable for pouring concrete.
- .5 If air temperature is below 5 °C, comply with cold weather concrete work requirements.
- .6 Between May 15 and September 15, pour the concrete deck during the evening and at night.
 - .1 Concrete pouring must begin no earlier than three hours before sunset and end no later than one hour before sunrise.
 - .2 The Contractor shall put lighting equipment in place for concrete work performed during the evening and at night, and provide the Departmental Representative with a plan of the intended lighting equipment at least two weeks before the start of concreting.
- .7 Maintain concrete temperature according to the MTQ's Standard 3101.
 - .1 Maintain the mixture at the maximum temperature defined in the above standard by adding ice and making sure not to alter the nominal water/cement ratio.
- .8 Immediately before pouring concrete, saturate the supporting surface with clean water.
- .9 Ensure that the concreting rate will allow for concrete pouring, finishing and curing operations to end on time.
- .10 Make sure that qualified concrete finishers and equipment operators have been hired.
- .11 Do not start pouring concrete before the finisher support and manoeuvring rails, as well as manual screed ties are secured in place.
 - .1 Rails and ties must be selected and installed in such a way as to prevent finishing equipment from rebounding or sagging under its own weight, and must allow finishing equipment to be used without interruption over the entire deck span.

- .2 Extend the finisher rails well beyond the ends of the length over which concrete is to be poured, so that finisher floats can clear the entire placed surface.
- .3 Place the rails and ties high enough for the bridge deck to comply with level and profile requirements, while accounting for the compacting, camber and sagging resultant from temporary shoring structures.
- .12 Immediately before concrete placing, check the temporary shoring structures and shims, and make the necessary adjustments.
 - .1 Provide the Departmental Representative with an appropriate way, such as an indicator, to measure compacting and sagging.
- .13 Pour the concrete at a uniform and approximately perpendicular alignment to the bridge axis, or at a parallel alignment to this axis if the screed is held in place by ties.
 - .1 Only pour concrete over a large enough area that work can be finished before initial setting begins.
- .14 Screed the concrete surface immediately after it has been poured and consolidated.
 - .1 Immediately correct any setting or step that does not provide satisfactory consolidation or surface smoothness.
 - .2 Unsatisfactory results may lead to rejection of material used and a requirement to remove concrete already in place.
- .15 Use floats to remove roughness and minor irregularities left by the finisher and to seal the concrete surface, according to the Departmental Representative's directives.
- .16 Adjust the rails and ties as necessary to correct the settlement or sagging that occurs during finishing work.
 - .1 Pass the finishing floats from the transversal scaffolds over the area to be smoothed. Install enough of the required type(s) of scaffolds, as per the Ministry Representative's instructions, so that floats can be passed without undue delay.
 - .2 Provide the Departmental Representative with a scaffold when a finisher is used to trowel the concrete surface lengthwise.
- .17 Finishing bridge deck slab: comply with Section 15.4.3.5.8 of the latest edition of the CCDG, *Infrastructures routières, Construction et réparation*.

3.3 PROTECTION

- .1 See Article 3.4 of Section 03 30 00.

END OF SECTION

Partie 1 General

1.1 REFERENCES

- .1 American Association for State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO Standard Specifications for Highway Bridges-17th Edition 2002.
- .2 ASTM International
 - .1 ASTM A325M, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength.
 - .2 ASTM A490M, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
 - .3 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.
 - .4 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlements of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .5 ASTM B833, Standard Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing).
 - .6 ASTM B6, Standard Specification for Zinc, High Grade.
 - .7 ASTM D4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
- .3 CSA International
 - .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA S6, Canadian Highway Bridge Design Code.
 - .3 CSA S16, Design of Steel Structures.
 - .4 CSA S269.1, Falsework for Construction Purposes.
 - .5 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
 - .6 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .4 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux (CCDG) – Infrastructures routières – Construction et réparation*, most recent version.
 - .2 *Ouvrages routiers, Normes, Tome III – Ouvrages d’art*
 - .3 *Ouvrages routiers, Normes, Tome VII – Matériaux*
 - .1 *Norme 6101 Acier de construction*

- .2 *Norme 6201 boulons, tiges d'ancrage, écrous et rondelles en acier*
- .3 *Norme 10102 Peintures et systèmes de peintures à base de zinc pour structures d'acier*
- .4 *Peintures et systèmes de peinture organiques pour structures d'acier*
- .5 *10104 Systèmes de peintures pour structures d'acier*

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation meetings
 - .1 Convene pre-installation meeting two (2) weeks prior to beginning installation work, with Departmental Representative, Contractor and specialized contractor, if required, in accordance with Section 01 31 19 – Project Meetings, with respect to:
 - .1 Project requirements
 - .2 Installation conditions and extent of support.
 - .3 Coordination with other construction subtrades.
 - .4 Manufacturer's written installation instructions and warranty requirements.
 - .2 Site meetings: Field quality control performed by the manufacturer as described in SECTION 3 – FIELD QUALITY CONTROL, must include site visits.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data
 - .1 Submit manufacturer's data sheets, instructions and printed product literature for structural steel. Data sheets to include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide WHMIS MSDS in accordance with sections 01 35 29.06 – Health and Safety Requirements and 01 35 43 – Environmental Procedures.
- .3 Shop drawings
 - .1 Submit drawings stamped and signed by professional engineer registered with the Ordre des Ingénieurs du Québec.
 - .2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.

- .3 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau. The number of the welding procedure data sheet and the type of non-destructive testing of welds must be indicated in the shop drawings, and in the case of field welding, in erection plans.
- .4 Two (2) weeks prior to field erection, submit to the Departmental Representative a description of the working methods, bracing, and temporary reinforcements, the order of erection and the type of equipment recommended with the capacity of the equipment used for erection of structural steel members, which must comply with CAN/CSA S6.
- .5 The Contractor must conduct a stability and strength study to ensure that the temporary forces due to assembly of the structure and those produced during the casting of the concrete slab, including forces resulting from winds, do not cause stresses greater than the permissible constraints or conditions of structural instability, including structural bearings. Forces to be considered are outlined in Section 15.7.1 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.
- .6 Once fabrication is complete, the Contractor shall provide the shop drawings showing the cast number of each of the parts used in the fabrication of the girders, tension members, and other load-bearing fracture-critical members.
- .7 Construction waste management
Submit project waste management plan highlighting recycling and salvage requirements.
- .4 Bolting procedure
 - .1 The bolting procedure must be provided at least 7 days before the start of bolting work.
 - .2 The bolting procedure must include a description of the equipment used at each stage of tightening and, for field splices on girders, it must specify the method of adjustment of the girder sections, as well as the sequence for installing and tightening the bolts.
 - .3 In addition, the calibration certificate for the device measuring bolt tension must also be attached to the bolting procedure. The certificate must contain the information on the device model and serial number, and must be less than 12 months old.
- .5 Welding and transportation
 - .1 The Contractor shall provide the Departmental Representative, at least 7 days before the start of fabrication and field welding, the documents relating to the fabrication and field welding, and at

least 14 days prior to transport of girders, the documents relating to transport. These documents must contain the information specified in Section 15.7.1 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.

- .6 The position and elevation of the structural bearings must be verified by the Contractor, and anomalies must be corrected. The Contractor shall provide the Departmental Representative, at least 7 days before the installation of girders, a survey report indicating the position (longitudinally and transversely to the work), the height and levelling of each installed structural bearing and the corresponding values specified in the plans. The report must be signed by an engineer member of the Ordre des Ingénieurs du Québec.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements 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 Ensure that the Departmental Representative has the delivery schedules at least seven (7) days prior to shipment of members.
- .3 Storage and handling
 - .1 Provide protective blocking for lifting, transportation and storing.
 - .1 Exercise care during fabrication, transportation and erection so as not to damage girders and beams.
 - .2 Do not notch edges of members.
 - .3 Do not cause excessive stresses.
 - .2 Mark weight on members weighing more than three tonnes.
 - .3 Protect unpainted weathering steel, before erection, with waterproof covering.
 - .4 Ensure that no portion of steel comes into contact with ground.
 - .1 Replace damaged members with new ones.
 - .5 At the end of each shift when girders have been installed, and after inspection of the girders by an engineer member of the Ordre des Ingénieurs du Québec, the Contractor shall submit to the Departmental Representative a written notice from the engineer indicating that the bracing and temporary works are installed according to the drawings and calculations of the erection method. The notice must also mention the time and date of the inspection.

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1.5 QUALITY ASSURANCE

- .1 Tests prior to construction
 - .1 Provide suitable facilities and cooperate with the inspection agency and the Departmental Representative in carrying out inspection and tests required.
 - .2 For each steel delivery to the manufacturer, the Contractor shall provide the Departmental Representative with a certificate of conformity containing the information specified in Section 15.7.4.1.2 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG) latest edition.
 - .3 For each delivery of galvanized steel members, the Contractor must provide the Departmental Representative with a certificate of compliance detailing the following information:
 - Name of the galvanizing company
 - Date and place of galvanization
 - Coating thickness
 - Coating adhesion
 - Coating quality

Partie 2 Products

2.1 MATERIALS

- .1 Structural steel according to CSA G40.20/G40.21, grade and type:
 - 350AT for the main girders and plates welded to the girders, metallic and painted. Thermal and energy requirements for the Charpy impact test according to CAN/CSA-S6. Charpy: 27 Joules. Test temperature $T_i = -20$ Celsius.
 - 350WT for diaphragms, galvanized.
 - 350W for bracing, galvanized.
 - Bolts ASTM A325, Type 1 galvanized, diameter 7/8", holes for bolts 24 mm unless otherwise stated. Connections bolted with threads excluded. Hot-dip galvanized surfaces must be cleaned by hand with a wire brush.
 - Shear studs: to CAN/CSA-S6
- .2 Anchor bolts, washers and nuts: to CSA G40.20/G40.21, grade 350W galvanized.
- .3 Welding electrodes: to CSA W48.

- .4 Galvanizing: to ASTM A123/A123M and ASTM A143/A143M.
- .5 Metallizing: to ASTM B833 and ASTM B6.

2.2 SOURCE QUALITY CONTROL

- .1 Qualification of the steel producer: certification according to CSA G40.20/G40.21.
- .2 Enterprise certification and qualification of welding personnel
 - .1 The Contractor must comply with the requirements specified in Section 15.7.4.1.1 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.
- .3 Return to Departmental Representative certified reports on Charpy V-notch impact tests.
- .4 Provide suitable facilities and cooperate with the inspection agency and the Departmental Representative in carrying out inspection and tests required.
- .5 A part cannot leave the plant until the manufacturer dimensional reports, non-destructive testing reports of welds and steel mill certificates have been submitted to the Departmental Representative.

Partie 3 Execution

3.1 VERIFICATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and written approval has been received from the Departmental Representative.

3.2 PREPARATION

- .1 Clean steel surfaces to the satisfaction of the Departmental Representative when staining or defacing occurs.
- .2 See section 1.4.6 to verify the position of substructure units, elevations of bearings and location of anchor bolts before erection of structural steel.

- .3 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking or sharply bending metal of any unit.
 - .1 Enlarge holes if necessary by reaming only after written approval is obtained from the Departmental Representative.
 - .2 Reamed holes not to exceed size of bolt used by more than 2 mm.
- .4 Fabricate and install bearings as indicated.
- .5 Place anchor bolts to elevations and locations indicated.
 - .1 Protect holes from infiltration of water and foreign material.
 - .2 Provide heating and protection as directed by the Departmental Representative and completely fill space around anchor bolts with grout.
- .6 Surface preparation for galvanizing (diaphragms and bracing):
 - .1 The surfaces to be galvanized must be clean, free of paint, grease, rust, etc.
 - .2 Deposits and residues from welding, carbon deposits and deposits of paint or thick rust must be removed by an appropriate method.
 - .3 The final pickling must be done by immersion in a caustic solution followed by a clean water rinse and immersion in a bath of dilute sulphuric or hydrochloric acid.
 - .4 After pickling, the parts must be immersed in an aqueous solution of zinc chloride and ammonium.
- .7 Steel surfaces of the bottom flange of girders coming into contact with welds connecting to structural bearings must be adequately masked at the fabricating plant. Field welds connecting girders to structural bearings must be protected by two layers of rich zinc coating with a minimum content of 87% metallic zinc in the dry film.
- .8 Steel surfaces of structural bearings in contact with the welds used to attach the girders to the structural bearings should be ground after galvanizing.

3.3 INSTALLATION

- .1 Fabricate falsework in accordance with CSA S269.1.
- .2 Fabricate and erect the structural steel members in accordance with CAN/CSA S6, Canadian Highway Bridge Design Code.
- .3 Welding: unless otherwise stated, perform welding work according to CSA W59 and Section 15.7.5.4 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.

- .1 Perform welding in shop, unless permitted elsewhere by the Departmental Representative.
- .2 Weld only at places indicated.
- .3 The design of the welds must meet the specified design requirements in Section 15.7.2 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition. In addition to the requirements of Section 15.7.5.4.2 of the CCDG for weld inspection, the Contractor must comply with the requirements of the forms in Appendix "Non-destructive examination of welds" and "Visual inspection of welds," which specify for each step of welding operations and for different works, the origin of the welding inspector responsible for visual inspection of welds.
- .4 High strength bolts: install high strength bolts in accordance with Section 15.7.6.1.1 *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.
- .5 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.
- .6 The drilling of steel members must meet the requirements of Section 15.7.5.3 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.
 - .1 The holes in the different parts to be assembled should be aligned to be able to freely insert studs at a right angle, i.e. bolts measuring 2 mm less than the holes.
 - .2 Unless otherwise stated by the Departmental Representative, the diameter of finished holes must not exceed the diameter of bolts to be inserted by more than 2 mm.
 - .3 Centre-to-centre distance between any two holes of a group to vary by not more than 1 mm from specified distance between such holes.
 - .4 Correct wrongly punched or poorly drilled members only according to directives of the Departmental Representative.
- .7 Span length tolerances
 - .1 Girders and beams: 6 mm more or less.
 - .2 Centre-to-centre of bearing stiffeners and bearing plates: plus or minus 3 mm.
- .8 Girder support requirements
 - .1 Support top and bottom flanges of ends of girders and intermediate bearing locations of continuous girders parallel to each other at 90 degrees to girder web.

- .2 Unless otherwise indicated, install the girders flat.
- .3 Install bearing stiffeners after girder support requirements have been met.
- .4 Correct irregularities of girder flanges as directed by the Departmental Representative.
- .9 Camber
 - .1 Camber tolerances for plate girders to be in accordance with CSA W59.
 - .2 Record measurements of camber of each girder, at points indicated.
 - .3 Fabricate field splices to conform to required camber.
 - .4 Submit to Departmental Representative a diagram showing the camber of each girder fabricated.
 - .5 Advise Departmental Representative immediately when camber of fabricated girder is not within specified tolerances.
 - .6 Submit proposal for corrective measures.
 - .7 Do not perform the corrections before they are approved by the Departmental Representative.
- .10 Shop erection
 - .1 Support each girder on its bearing points and measure and record deflection at same points indicated for measurement of camber.
 - .2 Measure deflections in plane of girder web.
 - .3 Submit diagram to Departmental Representative showing deflection measurements for each girder before delivery.
 - .4 Shop erection is not required for single span girders with no field splices.
- .11 Mark members in accordance with CSA G40.20/G40.21.
 - .1 Do not use die stamping.
 - .2 Place marking at locations not visible from exterior after erection when steel is to be left in unpainted condition.
- .12 Match marking: shop mark bearing assemblies and splices.
- .13 Braces and other temporary structures must remain in place until the concrete slab has reached 70% f'_c verified by tests on control samples cured in the same conditions as the work.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's field quality control:

- .1 Obtain a written report from the manufacturer confirming compliance of the work with the specified criteria in regard to the handling, installation, application of products and the protection and cleaning of the work.
- .2 The manufacturer must submit recommendations on the use of product(s), and conduct periodic visits to verify if installation was performed according to the recommendations.
- .3 Plan site visits by the manufacturer representative at the following stages:
 - .1 After delivery and storage of products on site, when preparatory and other prerequisite preparations are complete, but before the start of the installation activities for the work covered by this section.
 - .2 Once the work is completed, after cleaning.

3.5 CLEANING

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

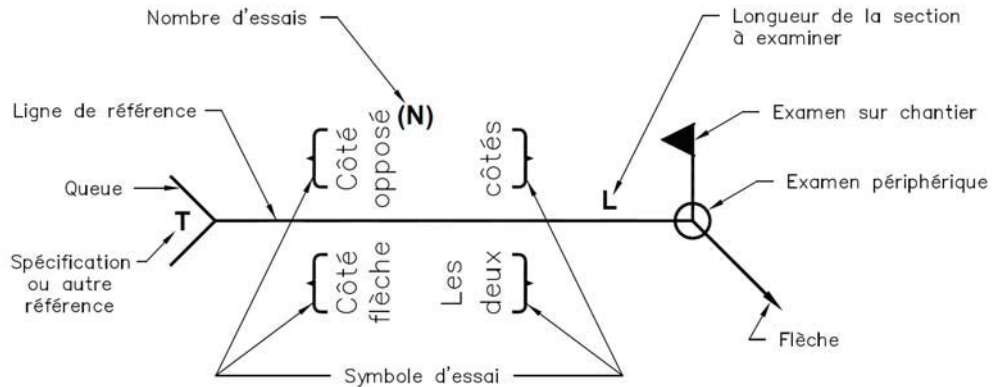
3.6 METALLIZING AND PAINTING

- .1 Steel surfaces of girders and plates welded to these girders must be metallized over their entire length to give a coating of 130 µm thick.
- .2 Metallizing of steel surfaces must be performed according to the requirements specified in Section 15.14.3 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (CCDG)*, latest edition.
- .3 Steel surfaces of girders and plates welded to the metallized girders must also be painted over their entire length to the requirements of Section 15.14.4.3.3 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation (CCDG)*, latest edition.
- .4 The top of the upper flange of girders need not be metallized or painted over its entire width. See instruction in plans.

- .5 The paints used are to be constituents of a paint system selected from those on the approval list, "Systèmes de peintures à base de Zinc", on the MTQ website.
- .6 The topcoat must be grey colour #16314 identified in the U.S. standard FED-STD 595B "Color Used in Government Procurement".
- .7 Bolts used for assembly of painted metallized steel surfaces must be galvanized.

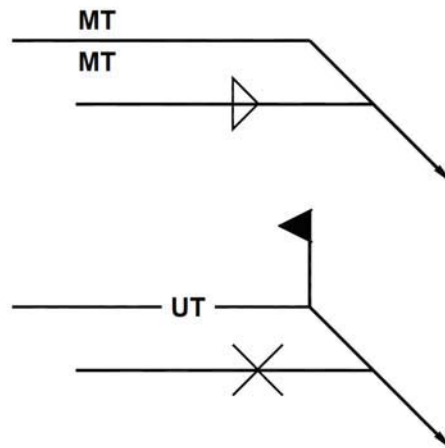
END OF SECTION

ANNEXE EXAMEN NON DESTRUCTIF DES SOUDURES



Symboles des examens:

- VT:** Inspection visuelle
- MT:** Magnétoscopie
- RT:** Radiographie
- PT:** Ressuage
- UT:** Ultrasons



EXAMEN NON DESTRUCTIF DES SOUDURES

ANNEXE VÉRIFICATION VISUELLE DES SOUDURES

| Ouvrages | Portée de l'inspection | Étapes des opérations de soudage où la vérification est exigée Usine et chantier | | | Inspecteur en soudage certifié CSA W178.2 | |
|---|---|---|---------|-------|---|---|
| | | Avant | Pendant | Après | À l'emploi d'un laboratoire certifié CSA W178.1 ou d'une entreprise certifiée CSA W47.1 | À l'emploi d'un laboratoire certifié CSA W178.1 |
| Ouvrages en acier, autres que ceux énumérés ci-dessous | Première vérification à 100 % sur toutes les soudures | √ | √ | √ | √ | |
| | Seconde vérification selon les mêmes critères que les examens non destructifs (MT, RT, UT) indiqués au CCDG | | | √ | | √ |
| Dispositifs de retenue en acier | Première vérification à 100 % sur toutes les soudures | | | √ | √ | |
| | Seconde vérification selon les mêmes critères que les examens non destructifs (MT, UT) indiqués au CCDG | | | √ | | √ |
| Joint de tablier | Vérification à 100 % sur toutes les soudures | | | √ | √ | |
| Appareils d'appui | Vérification à 100 % sur toutes les soudures | | | √ | √ | |
| Assemblage d'un appareil d'appui à une poutre principale | Vérification selon les mêmes critères que les examens non destructifs (MT) indiqués au CCDG | √ | √ | √ | | √ |
| Pointes pour pieux en bois et en acier en H | Vérification à 100 % sur toutes les soudures | √ | √ | √ | √ | |
| Joints bout à bout dans un pieu en acier et un pieu caisson; assemblage d'une pointe (conventionnelle, « OSLO ») à un pieu tubulaire en acier et d'une pointe « OSLO » à un pieu en H en acier ; soudures de pointes OSLO | Première vérification à 100 % sur toutes les soudures | √ | √ | √ | √ | |
| | Seconde vérification selon les mêmes critères que les examens non destructifs (MT, UT) indiqués au CCDG | | | √ | | √ |
| Soudures de fabrication des pieux tubulaires | Première vérification à 100 % sur toutes les soudures | √ | √ | √ | √ | |
| | Seconde vérification selon les mêmes critères que les examens non destructifs (MT, UT) indiqués au devis | | | √ | | √ |

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Partie 1 General

1.1 REFERENCES

- .1 American Association for State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO, Standard Specifications for Highway Bridges, most recent version.
- .2 ASTM International
 - .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.
 - .5 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .6 ASTM B833, Standard Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing).
 - .7 ASTM B6, Standard Specification for Zinc, de type High Grade.
 - .8 ASTM D4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
 - .9 ASTM D4894, Standard Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials.
 - .10 ASTM D5973, Standard Specification for Elastomeric Strip Seals with Steel Locking Edge Rails Used in Expansion Joint Sealing.
- .3 CSA International
 - .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16, Design of Steel Structures.
 - .4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59, Welded Steel Construction (Metal Arc Welding)
 - .6 CSA S6-06, Canadian Highway Bridge Design Code.

- .4 Health Canada - Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation, (CCDG), most recent version.*
 - .2 *Ouvrages routiers, Normes, Tome III – Ouvrages d’art*
 - .3 *Ouvrages routiers, Normes, Tome VII – Matériaux*
 - .1 *Norme 6101 Acier de construction*
 - .2 *Norme 6201 Boulons, tiges d’ancrage, écrous et rondelles en acier*
 - .3 *Norme 14101 Pellicules rétrofléchissantes*
 - .4 *Norme 3901 Coulis cimentaires*

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals 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, pipes, tubes and bolts and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS in accordance with sections 01 35 29.06 – Health and Safety Requirements and 01 35 43 – Environmental Procedures.
 - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration (in g/L).
- .3 Shop drawings
 - .1 Submit drawings stamped and signed by professional engineer registered with the Quebec Order of Engineers (OIQ).
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .3 Construction waste management
 - .1 Submit project waste management plan highlighting recycling and salvage requirements.
- .4 Bearings
 - .1 The Contractor shall provide the Departmental Representative with shop drawings and design calculations for bearings as specified in

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Section 15.9.1 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.

- .2 The Contractor shall provide the Departmental Representative with shop drawings of the deck joint.
- .3 The Contractor shall provide the Departmental Representative with shop drawings of guardrails.

1.3 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.

.3 Bearings

The Contractor must submit to the Departmental Representative at least 7 days prior to fabrication of bridge bearings, a certificate of conformity with information on the properties of elastomeric compounds, stainless steel and sealing rings.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements 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 off ground 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 Bearings

- .1 The materials and fabrication must comply with CAN/CSA S6, Canadian Highway Bridge Design Code, with the details specified in section 15.9.1.3 of the *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, (CCDG), latest edition.

- .2 Bearing plates welded to the lower flange of steel girders must be galvanized steel grade 350AT.
- .3 Steel surfaces of structural bearings in contact with the welds used to attach the girders to the structural bearings should be ground after galvanizing.
- .4 Field welds connecting girders to structural bearings must be protected by two layers of rich zinc coating with a minimum content of 87% metallic zinc in the dry film.

.2 Deck joint

- .1 The elastomer gasket must comply with ASTM D5973, Standard Specification for Elastomeric Strip Seals with Steel Locking Edge Rails Used in Expansion Joint Sealing.
- .2 Structural steel: to G40.21-300W.
- .3 HSS 350W.
- .4 Interlock system: standard G40.21 350W except for the profile extruded according to ASTM A36.
- .5 All steel parts must be galvanized (except for temporary connection angles and retaining brackets).

.3 STEEL FASTENERS

- .1 Structural steel:
 - .1 Standard G40.21, grade 350W Galvanized
 - .2 Anchor plates, grade 300W
 - .3 HSS profile grade 350W Class H or C Galvanized
 - .4 To ASTM A500, grade C, galvanized
- .2 Round head bolts, ASTM A449 Galvanized
- .3 Other bolts: Standard ASTM A307 Galvanized
- .4 Anchor rods: ASTM A449 Galvanized or ASTM F1554 Grade 105 Galvanized (F_u smaller or equal to 1035 MPa), installed before pouring the slab

.4 Steel drain

- .1 Structural steel: grade 300W galvanized
- .2 HSS profile grade 350W galvanized
- .3 Threaded rods and galvanized nuts

.5 Welding materials: to CSA W59.

.6 Welding electrodes: to CSA W48 Series.

.7 Cementitious grout: See MTQ Standard 3901 "*Tome VII - Matériaux*"

2.2 METAL FABRICATIONS - GENERAL

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 BEARINGS

- .1 The bearings of a supplier must obtain prior approval by the Department.
- .2 The laminated elastomeric bearings are described in Appendix 1 "Laminated Elastomeric Bearings".
- .3 The design of the bearings must comply with CAN/CSA S6 "Canadian Highway Bridge Design Code" with the following details:
 - .1 The laminated elastomeric bearings must have a minimum rotational capacity of 0.015 radian under boundary conditions of use. The average deformation by compression of each elastomeric layer must be less than 7% of its respective thickness;
 - .2 In the case of laminated bearings, the size indicated in the plans and specifications for the thickness of the bearing is given for guidance only.
 - .3 The manufacturer is responsible for calculating the dimension in order to meet the requirements of CAN/CSA S6, "Canadian Highway Bridge Design Code".
 - .4 When the bearing provided has a different thickness from that indicated in the plans and specifications, the length of the anchor bolts and thickness of the stop plates must be modified accordingly.
 - .5 The dimensions given in the plans for the length and width of bearings must however remain unchanged.

2.4 DECK JOINT

- .1 Unless otherwise indicated in the plans and specifications, design and fabrication of deck joints must comply with CAN/CSA S6, "Canadian Highway Bridge Design Code".
- .2 The deck joint must comply with the plan and be provided by a manufacturer approved by the MTQ.

2.5 STEEL DRAINS

- .1 The steel drains must comply with the plan.

- .2 The Contractor shall provide the Departmental Representative with shop drawings of the steel drains.

Partie 3 Execution

3.1 VERIFICATION

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

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 Departmental 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 Make field connections with bolts to CSA S16.
- .7 Deliver items and setting templates for casting into concrete to appropriate location.

3.3 BEARINGS

- .1 The installation of the bearings must comply with CAN/CSA S6 "Canadian Highway Bridge Design Code" with the following details:
 - .1 The pedestal elevations are based on the thickness of the bearings shown in the plans and specifications. If the bearings have a different thickness, the elevation of the pedestal must be adjusted accordingly;

- .2 The Contractor must ensure that the type of electrode used for welding bearing upper plates to girders is compatible with the type of steel in plates and girders;
 - .3 After completion of field welding, welds and surrounding uncoated steel surfaces must be protected by two layers of zinc rich coating.
- .2 Unless otherwise specified in the plans, the nuts of anchor rods of bearings should be securely tightened with a spud wrench of a length of about 400 mm. After tightening, the threaded end of the anchor rods must exceed the nut by at least 3 mm.
 - .3 The Contractor must install the girders, after the concrete of pedestals has reached a compressive strength of 20 MPa. On the other hand, in the case of non-sliding laminated elastomeric bearings, the girders must not be installed on the bearings unless the ambient temperature is between -10°C and 20°C and, in the case of mobile bearings fastened by anchoring rods, these rods must be centred in the slotted holes of the upper plate.
 - .4 The bearings and bearing plates must be protected when abrasive blasting work or concrete work takes place nearby.

3.4 DECK JOINT

- .1 The installation of the deck joints must comply with CAN/CSA S6 "Canadian Highway Bridge Design Code" and with the requirements of shop drawings, together with the following details:
 - .1 The deck joint must be installed only after pouring a slab, in the spaces existing at the end of the slab and the upper part of the backwall;
 - .2 The longitudinal and transverse slopes of the shoulders of the deck joint of a new slab must match the profiles in the plans.
 - .3 The opening of a joint in one section must be adjusted according to the opening specified in the plans, according to the temperature of the air measured under the bridge during the fixing of the joint;
 - .4 No part of the deck joint may exceed the level of curbs, sidewalks, bike paths or the concrete guardrail located on either side of the joint, but must not be more than 15 mm below this level;
 - .5 The joint must be positioned by threaded rods and be secured with spot welds on the reinforcements of the slab and curb;
 - .6 The temporary angles or assembly plates must be removed after installation of the joint;
 - .7 Installation of the elastomeric seal must be performed using suitable tools provided by the joint manufacturer. The seal must be applied over the whole length of the joint in a single operation and

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after concreting. On the other hand, in the case of a joint installed as a single length, the permanent seal may be installed at the manufacturer's plant;

- .8 The deck joint with elastomeric seal must be watertight after installation. In the presence of the Departmental Representative, the Contractor must conduct a deck joint leak test using a water jet of 20 mm in diameter and a minimum pressure of 700 kPa. The water jet must be trained on the seal with a back and forth motion for a period of at least 30 minutes. The Contractor must provide the Departmental Representative access to the deck pedestal beneath the deck joint during the leak test;
- .9 Any leaking seal must be repaired and undergo a new leak test.

3.5 STEEL FASTENERS

- .1 During concreting, the threaded ends of anchor rods must be protected by tape.
- .2 The nuts of anchor rods of steel fasteners must be securely tightened with a spud wrench of a length of about 400 mm. After tightening, the threaded end of the anchor rods must exceed the nut by at least 3 mm.

3.6 STEEL DRAINS

- .1 The drain must be placed so that the top exceeds the plane of the surrounding surfaces of the slab by 30 mm, and the bottom is 150 mm lower than the bottom of the respective girder.
- .2 The drains must be installed at the locations indicated on the plans or at locations designated by the Departmental Representative.

3.7 CLEANING

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

3.8 PROTECTION

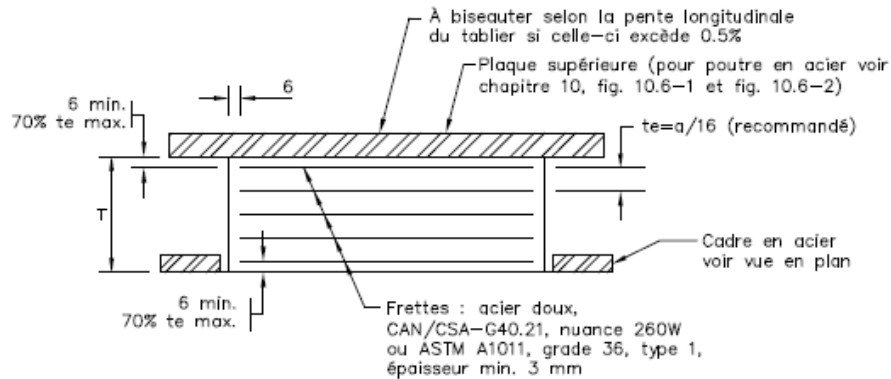
- .1 Protect installed products and components from damage during construction.

- .2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

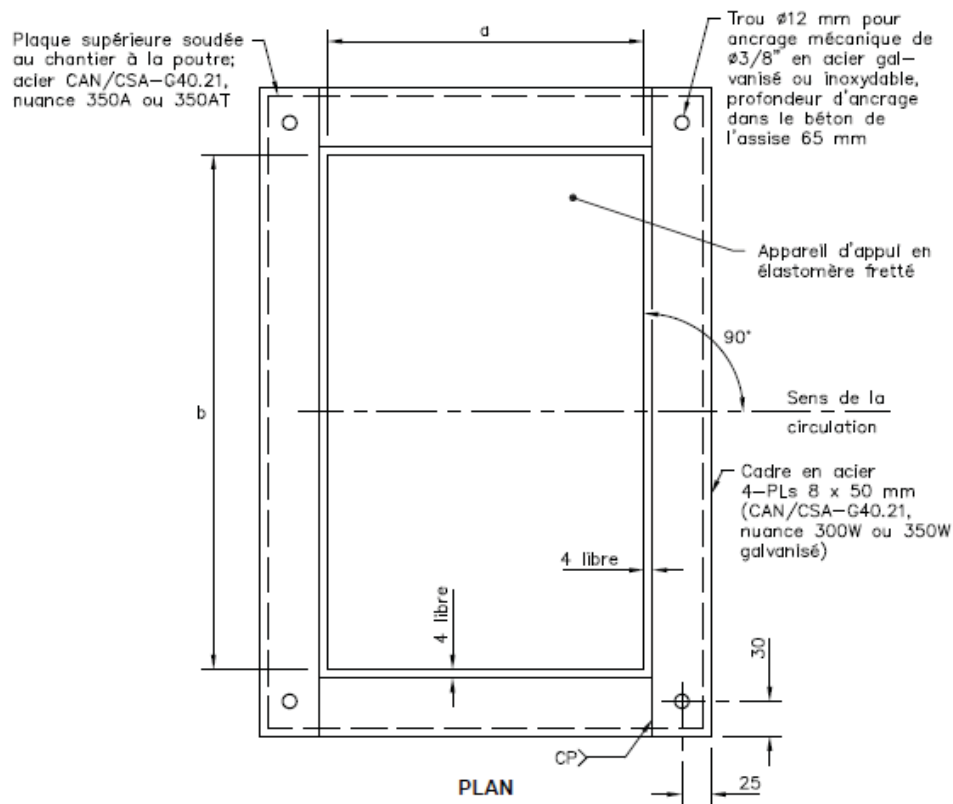
Appendix 1

Laminated Elastomeric Bearings



Recommandé
 $b/a = 1,75 \text{ à } 2,5 \pm$

COUPE AU CENTRE



Notes :

- Le cadre en acier est requis pour les appareils d'appui mobiles situés sous les poutres en béton.
- La plaque supérieure en acier est requise pour les appareils d'appui situés sous les poutres en acier.

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Approved: 12-31-2008

Partie 1 General

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM C836, Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Water-proofing Membrane for Use with Separate Wearing Course.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
- .3 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, latest edition.
 - .2 *Ouvrages routiers, Normes, Tome VII – Matériaux, norme 3701, Membrane d'étanchéité*, latest edition.
 - .3 *Liste des matériaux relatifs au béton éprouvés par le Laboratoire des chaussées*, latest edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data
 - .1 Provide the most recent technical waterproofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide WHMIS MSDS in accordance with sections 01 35 29.06 - Health and Safety Requirements and 01 35 43 – Environmental Procedures. The MSDS must indicate the VOC content for the following products:
 - .1 raw materials;
 - .2 bitumen;
 - .3 sealing products;
 - .4 filter cloth.
- .3 Manufacturer's Certificate: certify that products meet or exceed specified requirements.

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- .4 Test reports and evaluation reports: submit the reports for the tests done in the laboratory, certifying that the membrane meets the requirements of this section.
- .5 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane, when required.

1.3 QUALITY ASSURANCE

- .1 When a receiving inspection is performed by a Laboratory mandated by the Owner, the sample collection will consist of:
 - .1 1 litre of bonding layering from a sealed container after mixing to uniformity;
 - .2 1 m² of membrane removed from a roll.

1.4 FIRE PROTECTION

- .1 Portable fire extinguishers
 - .1 Permanent pressure, rechargeable portable fire extinguishers equipped with a supply hose and a nozzle with a stop valve.
 - .2 ULC certified fire extinguishers for Class A, B, and C fires.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Store materials in a dry location, sheltered from weather, and in a manner so that they are not in contact with soil.
- .2 Store rolls of membrane in upright position.
 - .1 In the case of membranes, the selvedge must be up.
- .3 Remove only in quantities required for same day use.
- .4 Limit any circulation on the surfaces covered with membranes.
- .5 Store sealants at +5°C minimum.
- .6 Handle waterproofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.
- .7 Store and manage hazardous materials in accordance with sections 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .8 Packaging Waste Management: remove and return all pallets, crates, and packaging materials for reuse by manufacturer.

Partie 2 Products

2.1 PERFORMANCE CRITERIA

- .1 It is essential for the various materials used in the sealing system to be compatible with one another.
- .2 The sealing membrane and the self-adhesive joint membrane to be used must be indicated in the list of the concrete-related materials tested by the roadways laboratory of the MTQ.
- .3 The self-adhesive joint membrane must have a nominal thickness of 3 mm. The following self-adhesive membranes are the only ones accepted:
 - Sopralene Flam Stick available from Soprema Inc.
 - Armourbon 180 available from IKO Ltd.
 - Bakor Modified Plus NP 180 Tack Sheet available from Henry Canada.

Partie 3 Execution

3.1 CLEANING OF SURFACES

- .1 Less than 48 hours before applying the tack coat and, if necessary, after removing the temporary pavement, all of the concrete surfaces of a new slab must be cleaned thoroughly using steel shotblast shot from equipment on wheels. Adjust equipment to have maximum intensity jet.
- .2 Slab surface must be dry at the time of cleaning. Cleaning of surface must not create a step in surface between two consecutive passes of equipment.
- .3 The surfaces located along and on the first 65 mm at the base of the curbs, sidewalks, bicycle paths, guardrails and deck joints must be cleaned using a dry abrasive jet; the use of a water jet or wet abrasive jet is forbidden.
- .4 The quality of this cleaning must be at least equivalent to that obtained with the steel shotblast.
- .5 Immediately before applying bonding layer and waterproofing membrane for new slabs, remove dust and debris with air jet. Equipment used for air jet must be equipped with a filter to capture oil; effectiveness of filter must be demonstrated before using equipment.
- .6 Clean or repair concrete surfaces dirtied by oily material.
- .7 Traffic is forbidden on the slab from start of cleaning work for a new slab, except for that of vehicles required to place membrane.

3.2 CORRECTION OF SURFACES

- .1 Accompanied by the Departmental Representative, verify the condition of the support, the curbs, sidewalks, drains and expansion joints to determine if the work can start.
- .2 The relief at any point of the slab surfaces is evaluated by the Departmental Representative in keeping with the volumetric method provided in ASTM E965 "Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique". The volume of sand or glass beads used for the test is 25 cm³. The minimum average diameter of the site for each measurement must be greater than 200 mm in the case of a new slab.
- .3 In the case of existing slab surfaces, the non-compliant surfaces must be corrected by filling the cavities using bagged cement mortar or by grinding any protuberances; the Contractor must indicate the surfaces to be ground to the Departmental Representative and wait for his approval before proceeding with the grinding. Curing is done by means of a curing material that forms a translucent membrane with a water-based, temporary dye. After curing and in the presence of the Contractor, the Departmental Representative will use a hammer to check the surfaces covered with cement mortar. The surfaces that produce a hollow sound, a sign of poor bonding, must be demolished and re-done at the Contractor's expense.
- .4 The bagged cement mortar used to correct the surfaces must provide compressive strength of at least 20 MPa at 24 hours.

3.3 APPLICATION OF WATERPROOFING MEMBRANE

- .1 Time frame, authorized period and weather conditions
 - .1 Contractor to give written notice to Departmental Representative at least 24 hours in advance to specify the date and time of application.
 - .2 In the case of a new slab, the bonding layer must be applied after a minimal period, after the concreting of the slab, of 14 days, namely 7 days after the concrete curing followed by 6 days after the complete removal of the curing materials and a period of 24 hours without precipitation. This 14-day period may, however, be reduced if the bonding layer is applied after a period of 3 consecutive days without precipitation after the complete removal of the curing materials or any stagnant water that remains following precipitation. The time period must, however, not be less than 10 days after concreting.
 - .3 The period for installing a waterproof membrane on a new slab runs from May 15 to November 1, for bridges located in Zone 1 or

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- between May 15 and October 15 for the other bridges. Zone 1 is defined in the decree issued by the MTQ concerning annual thawing periods.
- .4 Placing of bonding layer and waterproofing membrane must only be performed when ambient air temperature and concrete temperature, measured in the shade, are greater than 5°C and rising.
 - .5 Placing of bonding layer or waterproofing membrane must not begin when precipitation is forecast; Contractor must cease work if precipitation comes during placing.
- .2 Bonding layer
- .1 Apply one coat of bonding layer at rate of 0.15 l/m² on surfaces to be covered by waterproofing membrane; this rate is calculated before evaporation of solvent or water.
 - .2 The bonding layer must be that specified by the manufacturer of the waterproof membrane.
 - .3 Contractor must protect against splashing sidewalks, bicycle paths, curbs, barriers, fences, expansion joints, etc. by means of cloths or of other appropriate material; the bonding layer must be applied by roller along such elements for a minimum width of 600 mm.
 - .4 Contractor must clean surfaces dirtied during execution of Work.
 - .5 Application of membrane must be done on clean and dry surfaces after a 12 to 24 hour period following application of bonding layer.
- .3 Waterproofing membrane
- .1 Deliver materials to Site in original packaging. Store rolls of membrane in upright position, protected from the elements.
 - .2 The membrane must be installed using mechanised installation equipment, except near the deck joints, namely the MACADEN10, MACADEN11, MACADEN12 or MACADEN20 models from Soprema, the GL-MAC1 to GL-MAC9 models from Groupe Lefebvre (M.P.R.) inc. or the R.P.-1 to R.P.-3 models from Étanchéité R.P. inc. If any of this equipment cannot install the membrane within 15mm of the curbs, the membrane near the curbs must be installed using the Mini-Macaden 1000 mechanised installation equipment. A roller must be integrated into mechanised application equipment.
 - .3 Adjust fusion parameters on account of evenness of surface to be covered and weather conditions (force of wind, temperature, etc.), so as to obtain during application a surface of melted bitumen at least 20 mm in front of roll of membrane and squeezing out of bitumen along joints.

- .4 Apply membrane starting from low points of area to be covered toward high point of transversal profile.
- .5 Transverse joints must be shifted in such a way as not to place more than three membrane thickness at any point.
- .6 The width of laps between membranes must be 75 mm for longitudinal joints and 150 mm for transverse joints.
- .7 Place membrane as close as possible along curbs, sidewalks, bicycle paths, barriers, drains and deck joints, not to exceed a distance of 15 mm.
- .8 Once the membrane has been installed, a flashing made of bitumen based plastic cement modified by an SBS (styrene - butadiene - styrene) polymer must be installed along the curbs, sidewalks, bicycle paths and guardrails. The flashing made of bitumen based plastic cement modified by an SBS polymer must be manufactured by Soprema (Antirock sealant). No flashing may be placed along deck joints or near drains.
- .9 Contractor must ensure that evacuation holes situated along drains are not obstructed by flashing.
- .10 Flashing must be placed on dry and clean surfaces and when the concrete temperature of deck is greater than 5°C and the minimum temperature of flashing at moment of placing is 20°C.
- .11 The triangular-shaped flashing at a minimum height of 15 mm and a minimal width of 50 mm.
- .12 Re-fuse lap joints badly fused after placing each band of membrane.
- .13 Once application is complete, carefully inspect membrane; air pockets and folds must be pierced and cover with a piece of membrane extending at least 100 mm beyond edge of membrane zone to be repaired.

3.4 PLACING ADHESIVE MEMBRANE FOR JOINTS

- .1 Bonding layer
 - .1 Apply one coat of bonding layer at rate of 0.15 l/m² on surfaces to be covered by waterproofing membrane; this rate is calculated before evaporation of solvent or water.
 - .2 The bonding layer must be that specified by the membrane manufacturer.
- .2 Adhesive membrane for joints
 - .1 Application of membrane must be done on clean and dry surfaces after a 12 to 24 hour period following application of bonding layer.

- .2 Place adhesive membrane for joints following concreting of surfaces to be covered with membrane after a minimum delay of 14 days, including 7 days of concrete curing followed by 6 days after complete removal of curing material and a period of 24 hours without precipitation. Period of 24 hours starts after the complete removal of standing water. This 14-day period may, however, be reduced if the bonding layer is applied after a period of 3 consecutive days without precipitation after the complete removal of the curing materials or any stagnant water that remains following precipitation. The time period must, however, not be less than 10 days after concreting.
- .3 Immediately before applying bonding layer and waterproofing membrane for new slabs, remove dust and debris with air jet. Equipment used for air jet must be equipped with a filter to capture oil; effectiveness of filter must be demonstrated before using equipment. If it is necessary to clean the site with water in order to have clean surfaces, this must be done before the 24-hour period without precipitation.
- .4 Heat surfaces to be covered by means of a propane torch immediately before application of membrane.

3.5 PROTECTION OF EXISTING WORK

- .1 Remove any bitumen drops or dirt immediately.
- .2 Protect the waterproof surface from damage that may be caused by circulation, among other things.
- .3 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.

3.6 CLEANING

- .1 Remove bituminous markings from finished surfaces.
- .2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
- .3 Repair or replace defaced or disfigured finishes caused by work of this section.
- .4 Waste management: Separate waste materials for reuse and recycling.
 - .1 Place materials defined as hazardous or toxic in designated containers.
 - .2 Clearly label location of salvaged material's storage areas and provide barriers and security devices.

- .3 Ensure emptied containers are sealed and stored safely.
- .4 Unused coating material must be disposed of at official hazardous material collections site as reviewed by Departmental Representative.
- .5 Unused adhesive, sealant and waterproofing materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .6 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.
- .7 Dispose of unused sealant material at official hazardous material collections site approved by Departmental Representative.
- .8 Dispose of unused asphalt material at official hazardous material collections site approved by Departmental Representative.

END OF SECTION

Partie 1 General

1.1 GENERAL CONDITIONS

- .1 The Contractor shall comply with all the specifications in this section in addition to those contained in any other document of the tender.

1.2 REFERENCES

- .1 Quebec Standards Office (BNQ) (latest edition):
 - .1 BNQ 1809-300: Construction Work – General Technical Clauses – Drinking Water and Sewer Pipes.
- .2 Quebec Ministry of Transportation (MTQ):
 - .1 *Cahier des charges et devis généraux*, most recent version.
 - .2 *Cahiers des normes, Ouvrages routiers*, most recent version.

1.3 PAVEMENT PRICE

- .1 The specifications concerning pavement price adjustment from CCDG (latest edition), will apply. The reference price for the calculation of the nominal price of pavement (excluding transportation) shall be:

PG 64-34: \$925.20/ton of pavement.

1.4 DEFINITIONS

- .1 Wherever the following words and terms are indicated, they are expected to have the following meanings, unless the context indicates something different:
 - .1 Departmental Representative: legal person who, for his technical ability, is mandated by the Owner to monitor works, control quantities and quality, look after materials reception and settlements;
 - .2 Laboratory: physical or legal person who, for his technical ability, is mandated by the Owner to perform qualitative tests on materials and to look after their implementation;
 - .3 Contractor: legal person whose tender is accepted by the Owner (or assigns as a contracting party with the owner) and who is responsible for the execution of the entire work;

- .4 Owner: City or Corporation who requesting bids and giving contract for the concerned works. In this contract the owner is Parks Canada Agency;
 - .5 Director: person responsible for the contract and directly involved in the contract decisions. He represents the owner in the contract, when required, or, in the absence of the director;
 - .6 Supervisor or Engineer: natural person who, by his technical ability, is the site Engineer who look after the work and control the quantities and work quality;
 - .7 Subgrade limit: natural ground or fill level who must be shaped to receive granular materials;
 - .8 Sewer: sanitary sewer systems, storm sewers and combined sewer;
 - .9 Aqueduct: Network of pipes and accessories for transporting drinking water from one place to another;
- .2 Whenever a term is used in this section to refer to a standard, it should be understood that reference is made to the most recent revision of this standard.

1.5 WARRANTY PERIOD

- .1 For the entire works, the warranty period is twelve (12) months after the issue of the substantial completion certificate (provisional acceptance of work).

1.6 SITE SUPERVISION

- .1 No supervision will be provided by the Owner on site. The Contractor shall provide by himself the safety of his materials and equipment during the construction period and until their provisional acceptance.
- .2 No claim for damages will be accepted by the Owner.

1.7 WORK SUPERVISION

- .1 All work performed by the Contractor shall be performed under the supervision of the Departmental Representative.
- .2 The Contractor must notify the Departmental Representative at least twenty-four (24) hours before the start or the reprise of the works.
- .3 If the Contractor fails to notify the Departmental Representative, the Contractor shall demonstrate, at his own expense and to the Departmental Representative's satisfaction, all work done in the absence of an inspector is realized upon plans and standards.

- .4 The Owner has the right to require from the Contractor to restart, at his expenses, all works that it has been done without the supervision of an inspector of the Departmental Representative.
- .5 After a second inspection of the same work judged deficient by the Engineer, the Contractor shall pay for all the expenses of coordination, monitoring and inspection.

1.8 MATERIALS

- .1 The Contractor is responsible for the preservation of all materials during transport, handling and storage and shall at all times take the necessary precautions to minimize energy consumption.
- .2 The Owner refuses all damaged materials that are not compliant with standards and the Contractor must carry out, at his own expense, those materials off site.
- .3 Different material sources and quality should be stored separately so full and fast inspection can be done at all time.
- .4 No materials to be stored or no Contractor's equipment shall be placed where they could cause danger to the circulation.
- .5 The Contractor must obtain and develop, at his own expense, all the land necessary for the safe storage of materials and equipment.

1.9 PROPOSED ELEVATIONS

- .1 The Departmental Representative has the right to change the elevation attached to this document. Indeed, the Contractor may not submit any claim for elevation changes of 150 mm or less. The Contractor has been notified 48 hours for all changes.

1.10 LOCATION OF EXISTING SERVICES

- .1 Position of utilities shown on the drawings has been established as a result of a compilation of all available data relating thereto. Before undertaking excavation, the Contractor shall call the existing utility services to obtain the most recent plans "as built." The Contractor shall obtain a written confirmation of the services' location and send a copy to the Departmental Representative.
- .2 The Contractor shall respect the companies' standards and special conditions to work near their infrastructures. Costs to comply with these

conditions, as well as to obtain permits, if required, must be included in the bid price.

- .3 The Contractor shall be responsible to take all measures to locate and identify these services and all damage to public utilities.

1.11 INFO-EXCAVATION

- .1 Before any work excavation, the Contractor has the responsibility and obligation to contact Info-Excavation (1 800 663-9228) in order to have the companies concerned locate underground services on the site of the work.
- .2 Repair of broken items indicated on the drawings shall be paid by the Contractor.

1.12 PROTECTION OF EXISTING STRUCTURES

- .1 The Contractor must not trespass, move along, leave materials or execute work on existing structures without the authorization of the Departmental Representative. He must also pay special attention to protect structures located near work.
- .2 Any existing damaged structures during work must be repaired by the Contractor, at its own expense and within a period of 24 hours. Otherwise the Departmental Representative has the right to contact another Contractor to perform the repairs and he can subtract to the progressive count the sums involved.

1.13 ACCESS TO WORK AND EASEMENT

- .1 Before work, the Contractor must obtain all temporary land access, passage or construction easement. He must also ensure that all the work is located within the boundaries shown on drawings and / or specified in the contracts easements.
- .2 The Contractor remains responsible for damage to private property, whether or not he signed arrangement with the owners concerned.
- .3 The Contractor must account for inherent costs relating to the construction and maintenance of temporary roads and accesses required to perform Work based on site conditions.

1.14 WINTER CONDITIONS

- .1 Because of the Project Schedule, some works may need to be carried out in winter conditions. The Contractor must take this into account when planning site work and be responsible for any direct or indirect costs relating to this.
- .2 Forillon National Park does not maintain the north sector road in winter. The Contractor is responsible for these maintenance costs during work execution.
- .3 The Contractor will not receive any compensation for maintenance/work relating to winter conditions.

1.15 SUB-CONTRACTING

- .1 The Contractor is responsible for coordination with subcontractors and between subcontractors. No direct correspondence will be done between the Departmental Representative and subcontractors of the Contractor. No claim on the Coordination between the Contractor and its subcontractors shall be permitted.
- .2 It is the responsibility of the Contractor to ensure that all items requested on plans and specifications are included in the subcontractor's submission (via BSDQ). If items are missing in the bids of subcontractors, the Contractor shall include those items in the bid submitted to the Owner.

1.16 WORK LINE

- .1 The Contractor is the only responsible for realizing the project, taking all measures and making full coordination.
- .2 The consequences of incorrect work lines are the responsibilities of the Contractor. The Contractor shall prepare an itemized list before excavation. The natural ground profile can be changed on the site to improve drainage. Coordination must be completed during all work long with all stakeholders.
- .3 If required, the itemized list must to be provided to the Departmental Representative before the work begins. All the elements to implement must be provided.
- .4 The Contractor must realize a full survey for the projected construction elements.
- .5 The Contractor must execute the grading and provide technical information to the Departmental Representative relative to picket on standard lists including chaining, existing pavement elevation, pole head elevation,

proposed paving and sidewalks elevation, the difference between the existing and the projected paving, as well as the slope between the two.

- .1 Perform chaining offset along the projected elements.
 - .2 Identified with benchmarks every 10 m, the beginnings and ends of curves, high points and low points, etc.
 - .3 Include costs of these survey works in its bid.
- .6 The Contractor shall provide after culverts work and before paving work, the survey of culverts to the Departmental Representative for validation. Once the Departmental Representative has validated all the works, the Contractor will be authorized to proceed with backfilling and paving works.
- .7 Once all the works is done, the Contractor must perform a survey of all constructed items and provide, 1 month after the end of works, an itemized list (x, y, z) of all elements built in AutoCAD ("dwg" format).
- .8 Motorized access equipment
1. The Contractor must provide motorized access equipment to enable the Departmental Representative to inspect Work and perform a general inspection in accordance with MTQ's structural management system. Both activities shall be carried out simultaneously.
 2. Following receipt of the Contractor's notice of end of Work, the Departmental Representative will inform the Contractor in writing of the date and time for which access equipment must be provided for a three-hour period. The minimum time between receipt of the Contractor's notice and the date of inspection by the Departmental Representative is two (2) weeks.
 3. Motorized access equipment to be HP-43 ft. (13 m) or equivalent approved by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 00 – Generalities (civil)
- .2 Section 31 23 11 – Civil, excavation and backfilling

1.2 SCOPE OF WORK

- .1 Provide supervision of the works, all manpower, equipment, tools, materials, transportation and other services necessary to conduct and complete all work specified in this section and in the contract documents, including, but not limited to:
 - .1 Cut up level with the ground trunks and stumps. The deforestation will be manually made by the staff of the Park. It should be noted that the wood resulting from the cutting was left on-the-spot. The entrepreneur will have to unload the wood;
 - .2 Clearing, grubbing , grubbing trees of all sizes and strains located in the work area to be designated by the Ministerial Representative of all shrubs and bushes , branches, etc.,
 - .3 excavation, stripping and storage of the top soil for later reuse,
 - .4 backfilling with compliant granular material, compaction of specified surfaces for the preparation of various works of this contract and the implementation of protective stone claddings .
- .2 The Contractor shall thoroughly clean the work area of all materials coming out from deforestation, grubbing and underbrush clearing he performed or resulting from work previously done. Deforestation includes the total removal of any tree, stump, etc. However, the Contractor shall strictly limit deforestation to areas affected by the work that must first be approved by the Ministerial Representative. The Ministerial Representative must approve areas affected by deforestation before the Contractor begins deforestation. Everything must be loaded, transported and disposed to a site in accordance with the Soil Protection and Contaminated Sites Rehabilitation Policy of Minister of Sustainable Development, Environment, Wildlife and Parks (MDDEFP). Unless otherwise instructed, the topsoil is primarily collected and put in a pile for later use in revegetation of some areas.
- .3 The coarse removal is to cut the trees and brush to a height above the ground not exceeding the prescribed height, and remove the gilets, tree-fall, stumps and debris littering the ground.

- .4 Close cut clearing means to cut, flush or near the existing ground level, standing trees, brush, shrubs, roots, stumps and logs partially buried, and removing the giblets and debris littering the ground.
- .5 Underbrush clearing involves removing brush, dead wood and trees with a trunk diameter less than 50 mm, and removing the giblets and debris.
- .6 Grubbing is grabbing stumps and roots to a depth below the existing level but now lower than the prescribed one and removing these materials. The grubbing shall be realized inside the work limits as approved by the ministerial Representative.

1.3 STORAGE AND PROTECTION

- .1 Prevent damage to trees, landscaping, natural features, bench marks, water courses, root systems of trees which are to remain.
 - .1 Repair damaged items to the satisfaction of the Ministerial Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by the Ministerial Representative.

1.4 DEFORESTATION

- .1 Clearing activities include, but are not limited to, providing equipment and manpower needed to achieve, according to good practice, the site clearing according to specifications on plans including:
 - .1 Logging strictly in the area of work approved by the Ministerial Representative.
 - .2 Loading, transport and disposal of debris to a site in accordance with the MDDEFP Soil Protection and Contaminated Sites Rehabilitation Policy.

1.5 CLEARING AND GRUBBING

- .1 Clearing and grubbing include, but not limited to, material and manpower needed to achieve, according to good practice, clearing and grubbing, for woodlands, wetlands or other, according to the specifications denoted on the plans including:
 - .1 Coarse removal, ground clearing, grubbing;
 - .2 Storage of topsoil and humus for later reuse;
 - .3 Excavation drainage and dewatering, in accordance with section 32 23 11 - Excavation and backfilling.

- .4 Loading, transport and disposal of debris and excess debris to a site complies with the MDDEFP Soil Protection and Contaminated Sites Rehabilitation Policy.
- .5 Cleaning wood chips from grubbing works.

Part 2 Products

2.1 WASTE MANAGEMENT AND DISPOSAL

- .1 The Contractor must supply the address where clearing and grubbing material will be piled. The site shall comply with the MDDEFP Soil Protection and Contaminated Sites Rehabilitation Policy.

Part 3 Execution

3.1 PREPARATION

- .1 Inspect site and verify with Ministerial Representative, items designated to remain. Notify utility authorities before starting clearing and grubbing.
- .2 Identify and delineate areas for topsoil storage.

3.2 CLEARING

- .1 The wood must be unloaded by means of a carrier on tracks or endowed with tires with high flotation. At no moment, the machinery will be allowed to cross or go over any present creeks

3.3 UNREFINED CLEARING

- .1 Stumps must be removed on the whole zone of the works with the exception of the zones of peat bogs where stumps are ready left in position and got away from short ground.

3.4 GROUND LEVEL CLEARING

- .1 Close cut clearing to ground level to within 100 mm of ground surface.
- .2 Perform close cut clearing by hand so that existing muskeg is not damaged.

3.5 CLEARING

- .1 Clear (open up) areas indicated up to the ground level.

3.6 GRUBBING

- .1 Tear away stumps and roots at least 200 mm below the ground level.
- .2 Remove stones and visible fragments of rock of a volume lower than 0,25 m³, but the biggest dimension of which is superior to 300 mm.

3.7 REMOVAL AND DISPOSAL

- .1 The works of clearing and grubbing include the load, the transport and the arrangement of fragments resulting from these works outside the construction site towards a site in compliance with the directives of the

policy of protection of grounds and from rehabilitation of grounds contaminated by the MDDELCC..

3.8 FINISHED SURFACE

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

3.9 TOPSOIL REMOVAL

- .1 Begin topsoil and humus removal in working areas after clearing, underbrush clearing and grubbing. Remove the thickness of topsoil and humus situated at a depth of one (1) meter below the infrastructure line within the construction area.
- .2 This clearing is part of 2nd class cuttings, even if the work requires it to be done separately or by material sorting.
- .3 Place topsoil and humus, to be reused in the project, in piles where indicated within the limits of Parc Forillon and protect in order to prevent contamination. The height of the pile shall not exceed 2 m.
- .4 Dispose topsoil overs that cannot be reused in the project in a site in accordance with MDDEFP Soil Protection and Contaminated Sites Rehabilitation Policy.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 00 00 – Civil Generalities
- .2 Section 31 11 00 – Clearing and Grubbing
- .3 Section 32 11 00 – Roadworks
- .4 Section 33 31 00 – Culverts
- .5 Section 32 91 21 – Civil Topsoil and Landscaping

1.2 SCOPE OF WORK

- .1 Ensure the supervision of work and supply all manpower, equipment, tools, materials, transportation and other services needed to carry out and complete all work described and specified in this section and in the contract documents including, but not limited to: excavation, stabilization, backfilling using approved granular materials and the compaction of excavations as indicated on plans and specifications.
- .2 The excavation and backfilling work described in this section refers to the excavation and backfilling of the trench for underground utilities as well as for large-scale excavation and backfilling work.
- .3 Excavations and backfilling includes all necessary work to bring the infrastructure to the longitudinal and transverse profiles indicated on drawings or required by the Ministerial Representative.
- .4 According to the nature of removed materials, the excavation is of 1st or 2nd class.

1.3 EARTHWORKS GUIDE

- .1 For information purposes, volumes of excavation and backfilling are given. These volumes are raw and do not included factors of use (FU) and an implementation factor (FM) of materials. The Entrepreneur has to estimate his own quantities of backfilling, excavation (including the top soil), as well as the factors of use (FU) and implementation factor (FM). No compensation will be paid to the Entrepreneur the case where the actual executed quantities would differ (and even if

they differ from more than 15 %) in more or less of those mentioned in this section.

- .2 The estimated volumes, for information purposes, are:

| Road | Excavation (m ³) | backfill (m ³) |
|-----------------|------------------------------|----------------------------|
| 132 | 35 500 | 20 000 |
| Secteur Nord | 1 900 | 300 |
| Cap-des-Rosiers | 800 | 500 |
| Total | 38 100 | 20 800 |

* These volumes do not included factors of use (FU) and an implementation factor(FM). The excavation of topsoil is included in the volumes of excavation. The volumes of excavation and backfill of the bridge are excluded from the volumes above.

1.4 REFERENCES

- .1 Bureau de normalisation du Québec (BNQ) (latest edition):
- .1 NQ 2501-255 : Soil - Determining the moisture-unit weight ratio - Test with modified compaction energy (2 700 kN.m/m³).
- .2 Ministère des Transports du Québec:
- .1 Cahier des charges et devis généraux du Québec - Infrastructures routières, Construction et réparation (latest edition) (Statement of Work and General Specifications – Road infrastructures, Construction and Repairs).
- .2 Cahiers des Normes, Ouvrages routiers, Tome VII "Matériaux" (Standards, Roadwork, Vol. VII "Materials", latest edition.
- .1 2101 Standard - Aggregates
- .2 2102 Standard - Granular materials for the base, sub-base, paved surface and shoulder.
- .3 2103 Standard - Granular materials for the cushion, surround, anti-contamination layer and filter layer.
- .3 Cahier des Normes Tome III « Ouvrages d'art » (Standards Roadwork, Volume III, latest edition)

1.5 DEFINITIONS

- .1 Additional excavation: any excavation work requested in writing by the Ministerial Representative in addition to that called for in the specifications.

- .2 Backfill materials: material placed over the surround or protective layer up to the level of the infrastructure, the definitive ground level or the natural soil.
- .3 Backfilling: operation, which consists in filling the trench and/or excavation using bedding, surround, fill material or borrow material.
- .4 Bedding material: bed for the pipe's installation.
- .5 Surrounding material: material between the top of the bed and the underside of the fill or borrow material.
- .6 Off-site borrow material: material from a source outside the worksite, which is required to fill excavations, build embankments, or other work when the excavated material is not reusable according to geotechnical specifications or are in short supply.
- .7 Reusable excavation material: material identified by the Ministerial Representative and according to the geotechnical advises as suitable for specific fill applications. This material can be obtained from any excavation on the worksite.
- .8 Classes of excavated material: two classes of excavated material are recognized, i.e., rock excavation (1st class excavation) and common excavation (2nd class excavation).
- .9 1st class excavation: refer to article « 1st class excavation » of the section « Execution ».
- .10 2nd class excavation: excavation of material of whatever nature other than that covered by the definition of excavation 1st class, including dense fill, compact clay, frozen materials and partly cemented materials, which can be ripped and excavated using heavy equipment. Stripping, trench cleaning and reshaping are considered to be 2nd class excavation.
- .11 Stripping: removal of organic material initially covering the ground, including land clearing materials.
- .12 Topsoil: any material likely to favor the growth of vegetation and capable of being used as complementary soil for landscaping or seeding. Furthermore, if it is present on the site, this material must be excavated where specified on the work site. Finally, this material is unsuitable for use as fill.

- .13 Digging of trenches: 1st or 2nd class excavation required for the construction of a trench for laying pipes and their accessories.
- .14 Unshrinkable fill: controlled density mix consisting of cement and aggregates.
- .15 Waste material: excavation materials unsuitable for reuse (trees, shrubs, bushes, branches, brush, stumps, dead wood and other vegetation waste and materials containing demolition debris) or surplus materials, which cannot be reused.

1.6 ELEMENTS TO BE SUBMITTED

- .1 The Contractor shall refer to Section 01 33 00 - Submittal Procedures and Documents.
- .2 Prior to the start of excavation work, the Contractor shall submit to the Ministerial Representative, for verification and approval details of dewatering and heave protection methods as required before undertaking the work.
- .3 Any non-compliant material shall be replaced by materials approved by the Ministerial Representative and the work shall be redone at the Contractor's expense.

1.7 PROTECTION OF EXISTING UTILITIES

- .1 Existing utilities and structures.
- .1 Before undertaking any excavation work, the Contractor has both the responsibility and the obligation to contact Info-Excavation (1 800 663-9228) in order for the companies concerned to identify the location of underground utilities and services present on the worksite.
- .2 Information relating to public utilities is based on available documents. It is provided to the Contractor for guidance purposes only and should not be considered to be complete or accurate.
- .3 Should private or public structures or utilities be found, whether or not they appear on the plans or are indicated on the contract property, crossing or close to projected excavation work, above or below ground, it is the Contractor's responsibility to obtain from the owners of these services and/or public utility organizations and companies all required information on the existence, nature, location, size, depth, etc. of these utilities or services.

- .4 The Contractor must, himself, and at his expense, conclude agreements with the companies concerned with regards to the procedure and program of the work to be carried out. He must transmit this program to the Ministerial Representative at least forty-eight (48) hours before work is to start near the structures that must be protected.
- .5 The Contractor must take all measures required to protect these structures against breakage and frost and/or provide the support needed to prevent collapse throughout the execution of the work which, even once it has been completed, must in no way affect the stability, quality and safety of existing structures. The Contractor alone is responsible for any and all damages incurred as a result of his work. All work to protect and support existing utilities or structures, including digging, is at the Contractor's expense.
- .6 Digging must be carried out to determine the exact location, depth, and dimensions of the underground services encountered, whether or not they appear on the plans. Excavation in the ground, whether frozen or not, is done by hand on each side of the existing underground services, over a distance of 1,5 m (5.0 ft.) and below, to the underside of the services involved. No additional remuneration will be granted for this work. The use of explosives is prohibited in this instance.
- .7 Obtain appropriate directives from the Ministerial Representative before moving or removing the utilities or structures identified in the excavation zone.
- .8 Note the location of the underground utilities retained, moved or abandoned.
- .9 In addition, the Contractor shall provide back into its original state, the land on which he performed the work, and on the total width of the right of way or easement owned by the company concerned.

1.8 CONDITION OF THE WORKSITE

- .1 Take into account the location and special conditions of worksite.
- .2 Take into account the level of the groundwater table and its impact on excavation conditions.
- .3 In the event that contaminated materials are detected during construction, these excavated materials must be managed in compliance with prevailing environmental and municipal regulations. Moreover, excavated materials containing demolition debris must be managed as "dry materials".

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- .4 The Contractor must coordinate his work with that of all other contractors, companies or public utility firms carrying out work of any nature whatsoever during the time when work covered by this contract is in progress.

1.9 SHORING AND BRACING OF EXCAVATIONS AND STRUCTURES

- .1 Shore and brace excavations to avoid slides, in compliance with construction safety codes, local regulations as well as the recommendations of the geotechnical report.
- .2 During excavation work, the Contractor must build the embankment(s) required and/or supply and install all steel sheeting, temporary support walls, cofferdams, bracing or other support required to successfully carrying out excavation work. The Contractor is fully responsible for the above-mentioned items.
- .3 All excavations in the vicinity of existing structures must be limited, and adequate shoring and bracing of existing excavations and exposed structures must be provided.
- .4 The Contractor is solely responsible for the choice of excavation methods used.
- .5 The Contractor is fully responsible for any damage to existing installations and services or any bodily injury resulting from the absence or precariousness of the temporary structures and/or improper leveling of the embankment.
- .6 The Contractor must provide a plan of these structures signed and sealed by an engineer who is a member of the Ordre des ingénieurs du Québec (OIQ - Quebec Order of Engineers).

1.10 PROTECTIVE MEASURES

- .1 Protect the bottom of excavations against any softening and should this occur, remove the softened soil and replace it with compacted MG-20b type granular materials.
- .2 Protect the bottom of excavations against frost.
- .3 Excavation and backfilling work must be carried out in compliance with the construction safety code and recommendations of the geotechnical advice.

- .4 Ensure the protection of vertical benchmarks, layout benchmarks, survey markers and geodesic monuments.
- .5 Never stockpile excavated material where it could interfere with the work, drainage or the stability of excavation slopes.
- .6 The Contractor is, at all times, responsible for protecting stockpiled materials, which he will store on the site or other location reserved for this purpose, In the case of debris and excavation surplus, he must determine their granulometric qualities and other physical characteristics, to determine whether they can be reused as priority fill materials. In the event of inadequate protection, the loading, transportation and disposal of this material at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy will be at the Contractor's expense.
- .7 At all times, the Contractor is required to take the necessary measures to keep dust generated by his work to a minimum.
- .8 The Contractor must enact all measures required in order to control the spill of sediments in waterways (see section 01 35 43 Environmental Protection).
- .9 At the end of each work day, all excavations must be secured to the satisfaction of the Ministerial Representative.

1.11 INSPECTION AND TESTS

- .1 The analysis and testing of materials and compaction are carried out by a specialized testing laboratory designated by the Parks Canada.
- .2 Parks Canada assumes the cost of the inspection and laboratory analyses. If, because of non-compliance, these tests must be repeated, costs shall then be assumed by the Contractor.
- .3 Granulometric analysis: fill materials are analyzed to determine their suitability for the projected use and their compliance with specifications.
- .4 Density analysis: tests are conducted on compacted materials in compliance with the NQ 2501-255 standard : Soil - Determining the moisture-unit weight ratio - Test with modified compaction energy.
- .5 Compaction tests:

- .1 The Owner reserves the right to have compaction tests carried out to determine if the required compactness has been achieved. The Contractor must collaborate on the execution of these tests and can base no claim on work stoppage or other loss of time resulting from the execution of these tests.
- .6 Testing frequency is defined by the Ministerial Representative.
- .7 This same laboratory must provide the Ministerial Representative with progressive reports confirming that the required tests have been conducted as required by the plans and specifications. Moreover, the laboratory must provide the Ministerial Representative with a final report confirming that all fill complies with the plans and specifications, and no concrete or pavement can be placed until this report has been provided.
- .8 Should the Contractor use a fill material other than the one sampled, all fill materials will have to be removed and replaced at his expense.

1.12 DENSITY OF COMPACTED MATERIAL

- .1 When compacted, fill material must have moisture content as close to the optimum determined by the laboratory using the maximum dry density test in keeping with the NQ 2501-255 standard. Sprinkle water on overly dry soil, taking care to avoid saturation.
- .2 The density of the compacted material is expressed as a percentage of the Modified Proctor maximum dry density.

1.13 GROUNDWATER TABLE

- .1 Limit the depth of the excavation to avoid problems relating to the stability of the bottom.
- .2 The Contractor is entirely responsible for the excavation measures required and adequate pumping to reduce the level of the groundwater table where required, as well as the control of the groundwater table while work is in progress, and all other additional work required by conditions encountered along the way.
- .3 All costs related to measures covered by the previous article must be included in the bid and no request for additional funds or schedule delay will be considered, should the Contractor have failed to take these into account.

1.14 HIDDEN ELEMENTS

- .1 The Contractor agrees that it will not hide any work such as pipes or otherwise, without first obtaining permission to backfill the Ministerial Representative.

1.15 ARCHEOLOGY

- .1 Particular conditions
 - .1 Due to the high risk of discovery of archeological elements during excavation work for the construction of a new segment of route 132 in Forillon National Park, these works shall be subject to the following section. The zones where the potential for archeological finds is present are located on the existing state of the site plans (archeological dig symbol).
- .2 Access and Collaboration
 - .1 The Contractor shall cooperate and conform to all directives from the Ministerial Representative during the excavation in order to avoid all loss of archeological information on the site
 - .2 The Contractor shall facilitate access and collaborate with the archeologist during the works. The archeologist, or their representative, shall be present at the site depending on the needs related to the protection and recording of artifacts. Their role shall be that of a guide to the Contractor in order to avoid any loss of archeological information and to collect and compile archeological information.
 - .3 The Contractor must allow the archeological team to proceed with their archeological examinations and surveys.
- .3 Archeological Discoveries
 - .1 The Contractor must advise the Ministerial representative, or in their absence, the archeologist and their representatives, of any archeological discovery (construction remnants or debris, objects, object fragments, etc.) on the site and await further directives before proceeding.
 - .2 Relics, antiquities and other elements of historical, archeological and scientific interest (object, fragments, etc.) found on the site, excavated or demolished areas remain property of the Crown. The Contractor must protect and obtain directives from the Ministerial representative on this matter.

.4 Stoppage of Works

- .1 The contractor shall anticipate in their contract, and at his own costs, complete halts to the excavation works, of 30 minutes per half day, in sectors requiring the presence of an archeologist (as described in article 1.14.1.1 of this section). These halts, if not used, may be accumulated and reused later if required. A time log of used and non-used halts to work due to archeological work shall be kept by the Ministerial Representative in accord with the archeologist and the Contractor. A minimum of 20 hours must be foreseen to this effect.
- .2 For halts longer than 30 minutes, the Ministerial Representative shall evaluate the implications of the halt and will advise the Contractor on the subject. The Contractor may have to move their machinery to another sector to permit the pursuit of archeological work. If a change in work location is impossible, the contractor shall be compensated by use of the banked hours and should those be exhausted, according to the agreements accorded in the first construction meeting.
- .3 The Contractor must consider these constraints and requirements in their planning and schedule of works. They must prioritise sectors where archeological finds are possible in order that these archeological works not delay the completion date of the works.

.5 Manual excavation for archeological work

- .1 Given the fact that archeological finds are possible, the Contractor is advised that during the works, manual excavation may be required as well as other works in order to preserve the protection of any discoveries. Should these works exceed the number of hours foreseen, the contractor shall be compensated according to the agreements accorded in the first construction meeting.

.6 Protection of artifacts and works

- .1 The contractor shall take all reasonable precautions, during the excavations and all other works, to protect all discovered artifacts and permit their examination by the archeologist. Parks Canada shall not tolerate any lapses in this matter. Should the Contractor deteriorate the condition of any remnant/artifact through negligence, the Contractor shall be

held responsible and the Agency shall be the judge of the consequences.

- .2 In the eventual case that the Ministerial representative authorises the demolition of archeological elements on the site, the Contractor shall take all necessary precautions to protect adjacent archeological elements that shall not be demolished. The demolition of such elements must be realised in a meticulous and controlled manner after the archeologists have completed their survey. If elements are damaged during the works, they must immediately advise the Ministerial Representative.
- .3 After the archeological surveys, the Contractor shall install geotextile membrane over the discovered remnants and recover them with the appropriate backfill matter. These works shall be undertaken under the supervision of the archeologist.

1.16 1ST CLASS EXCAVATION

- .1 The requirements of 1st class excavation, referred to in this present section, are completed by section 31 23 16.26- Rock Removal

1.17 EXCAVATION SURPLUS

- .1 If the Contractor removes an excavation volume greater than the one determined by the theoretical section, no additional remuneration is permitted except if the Contractor has received written notice of otherwise by the Ministerial Representative.

1.18 ROCK MEASURING

- .1 The rock is paid according to volume in place before dynamiting or mechanical fragmentation. The level of the rock in place before dynamiting or mechanical fragmentation is established on site by the Ministerial Representative in the presence of the Contractor. The Contractor must warn the Ministerial Representative each time he meets rock or another material payable with the item "dynamiting of 1st class material". If the Contractor neglects informing the Ministerial Representative, the Contractor cannot claim any reclamation for dynamiting 1st class material excavated without the Ministerial Representative or its representative on worksite

Part 2 Products

2.1 RECYCLED MATERIALS

- .1 The recycled materials must meet the standard « Granulats - Matériaux recyclés fabriqués à partir de résidus de béton, d'enrobés bitumineux et de briques - Classification et caractéristiques » NQ 2560-600. The information concerning the use of recycled materials is given in different appendices of this standard according to classification and characteristics of these materials.
- .2 The use of recycled materials may be used only with the approval of the Ministerial Representative is governed by all the other technical requirements appearing within the present estimate as for compactness, thickness of layers, etc.

2.2 GRANULAR MATERIALS

- .1 As granular materials, use only natural non-plastic soil such as sand or graded crushed stone as stipulated in the specifications. These materials must comply with the Quebec Department of Transport's 2101 and 2102 standards relating to the granulometry and physical and mechanical properties of the aggregates. Materials must first be approved by the laboratory and the Ministerial Representative.
- .2 The diameter of the crushed stone must not exceed one third of the thickness of the base layer or larger than 112 mm.
- .3 The granular materials must satisfy the requirements of standard NQ 2560-114- Civil Engineering works - Aggregates:
- .4 The grading envelopes of granular materials must meet the requirements of the following "Grading Envelope of Granular Materials" table while the physical and mechanical properties of the granular materials must meet the requirements of the following "Physical Properties of Aggregates for the Roadway Infrastructure and Base Course" table:
- .5 Conformity: All granular materials not respecting the requirements enumerated previously are refused and must be replaced by materials in conformity with the following requirements.

Grading Envelope of Granular Materials

| Granular materials | Sieve (mm) | | | | | | | | | Sieve (µm) | | | |
|--------------------|------------|-----|--------|-------|--------|-------|-----|--------|-------|------------|-------|------|------|
| | 112 | 80 | 56 | 31,5 | 20 | 14 | 10 | 5 | 1,25 | 630 | 315 | 160 | 80 |
| (% passing) | | | | | | | | | | | | | |
| MG-20 | - | - | - | 100 | 90-100 | 68-93 | - | 35-60 | 19-38 | - | 9-17 | - | 2-7 |
| MG-20b | - | - | - | 100 | 90-100 | 68-93 | - | 35-60 | 19-38 | - | 9-17 | - | 5-11 |
| MG-56 | - | 100 | 82-100 | 55-85 | - | - | - | 25-50 | 11-30 | - | 4-18 | - | 2-7 |
| MG-112 | 100 | - | - | - | - | - | - | 12-100 | - | - | - | - | 0-10 |
| MG-112 modified | 100 | - | - | - | - | - | - | 20-75 | - | - | - | - | 0-10 |
| Installation bed | - | - | - | - | - | - | 100 | 95-100 | 50-85 | 25-60 | 10-30 | - | 0-10 |
| Stabilized sand | - | - | - | - | - | - | 100 | 95-100 | 50-90 | 25-65 | 10-35 | 4-25 | - |

** To be respected before and after compaction.*

Physical Properties of Aggregates for the Infrastructure and Base Course

| Designations | Physical properties | | | | | |
|--------------|-------------------------|----------------------|--------------------|----------------------|----------|--------------|
| | Organic Matter max. (%) | Micro-Deval (MD) (%) | Fragmentation min. | Los Angeles (LA) (%) | MAX. (%) | Blue Value |
| | Standards | | | | | |
| | LC 31-228 | NQ 2560-070 | LC 21-100 | BNQ 2560-400 | MD + LA | BNQ 2560-255 |
| MG-20 | 0,8 | 35 | 50 | 50 | 80 | 0,20 |
| MG-20b | 0,8 | 35 | 50 | 50 | 85 | 0,20 |
| MG-56 | 0,8 | 35 | 50 | 50 | 80 | 0,20 |
| MG-112 | 0,8 | 40 | - | 50 | 85 | 0,20 |

2.3 EXCAVATED MATERIALS

- .1 The contractor must re-use the excavated material as backfill material if they are compactable; if they respect the requirements of article 11.6.1 of the CCDG; if they are exempt from organic soil, frozen soil, shale, pyrite schist; and if they are approved by the Ministerial Representative. Blocks of rock with a maximum dimension of 500mm may be recovered and pushed to the side of the road backfill, outside of the zone included in the 1V:1H slopes beginning from the exterior of the shoulders.

- .2 The loading, transport and disposal of surplus/non-used excavated material on the site shall be the responsibility of the Contractor and should conform to the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.

2.4 BACKFILL MATERIALS

- .1 Backfill materials must be approved by the Ministerial Representative prior to their use. They are from site for use beneath the roadway infrastructure line. Should insufficient excavated material be available, borrow material shall be used.
- .2 All compactable materials and comply with the 1101 standard MTQ can be used if they meet the requirements of Article 11.6.1 of the CCDG MTQ except organic soils, contaminated soil and frozen soil. Soil components must be mineral in nature. The use of these materials depends on their condition, the height of the embankments to be built and weather conditions. If required by the plans and specifications, the condition of the materials must be improved using an appropriate treatment. A reference board or particle size analysis should be performed on the excavated materials stack, and, as mentioned in the geotechnical advice.
- .3 Materials must be free of foreign bodies such as brick fragments, roots, trees, lawn, ash, fly ash, frozen soil, contaminated soil, snow, ice, etc.

Part 3 Execution

3.1 SITE PREPARATION

- .1 Within set limits and approved by the Ministerial Representative, cut trees, grub and strip site, remove obstacles, ice and snow from the surface of the excavation zone. Reserve canopy and provide transportation to site and removal.
- .2 Materials removed must be disposed of off-site, in keeping with the article "Disposal of waste materials" in this section.
- .3 Roads and access ramps must be built on the worksite, as needed, and maintained by the Contractor throughout the duration of excavation work.

3.2 EXCAVATION EQUIPMENT

- .1 Excavation equipment must be suited to the projected work and sized to carry it out effectively.

3.3 THEORETICAL EXCAVATION AND FILL LINES

- .1 A theoretical typical section of a trench excavation shall comply with both BNQ and CSST standards.
- .2 It is understood that the Contractor shall, at all times, comply with the "Code de sécurité pour les travaux de construction" (Safety Code for Construction Work) in effect in the province of Québec.

3.4 1ST CLASS EXCAVATION

- .1 Generalities
 - .1 The 1st class excavation includes the removal of the rock and the concrete works or strongly cemented masonry, as well as stones of a dimension equal or higher than 1.0 m³. The 1st class excavation also includes the removal of massive or schistous rock formations, whose extraction can be adequately made only after being beforehand broken using a ripper.
 - .2 The stone beds in clay, the disaggregated schist, the resistant ground "hard pan" and the cold ground do not constitute 1st class excavation, even if their extraction cannot be done adequately using a general purpose excavator.
 - .3 Rock cutting must be confined within the theoretical limits indicated by the Ministerial Representative. The slope inclinations must be of 5 V : 2 H (5,0 m vertically over 2,0 m horizontally). Any rock point salient on the cut walls must be struck off and the rock fragments, broken or cracked, must be removed.
 - .4 At the bottom of the cut of rock, any point salient of more than 80 mm above the required level must be struck off. Depressions under the infrastructure line must be filled by MG-20b stone or MG-112 up to the required level. This backfilling must be made at the expenses of the Contractor.
 - .5 The Contractor cannot claim any compensation for the composition, the hardness or the type of rock formation encountered; making its extraction more expensive than envisaged.
- .2 Disposal of 1st class excavated material

- .1 The Contractor must dispose 1st class excavated materials in conformity with the requirements of article "Excavation surplus disposal".

3.5 2ND CLASS EXCAVATION

- .1 2nd class excavation includes all excavations, which are described as 1st class excavation in the preceding article. Excavation materials coming from trench cleaning and reshaping are part of 2nd class excavation quantities.
- .2 Notify the Ministerial Representative at least one week prior to the start of excavation work and, in his presence, note the land's natural profile where required.
- .3 Dig trenches along the theoretical lines, cross-sections, layouts, levels and dimensions indicated.
- .4 Transitions must be performed as per the requirements of article 11.4.6 of the CCDG and as shown on the typical sections and normalised drawings. Excavation and backfill of transitions are paid in the line item 2nd Class Excavations.
- .5 Debris from building materials such as bricks, concrete, wood, old paving, sidewalks, curbs, or roundhead central mall, riprap, walls, stone fences etc., may be encountered during excavation. The materials must be managed as "dry materials". Refer to the section "Layout scrap materials" in this section.
- .6 The bottom of the excavations must be level, consist of dry, undisturbed soil, and free of organic or loose matter. Reworked soil must be removed by hand.
- .7 Fill unneeded excavations at no additional cost, as follows: The excavation shall be filled using excavation materials deemed to be reusable, free of stones measuring more than 150 mm (6 in.) in diameter, frozen material or organic matter. Voids will be filled using a finer material. The Contractor shall compact materials to 90 % of the Modified Proctor in successive layers with a maximum thickness of 200 mm (8 in.), until the level required to restore and/or shape the infrastructure of existing or projected elements. If excavation surplus is deemed to be non-reusable, the Contractor shall use borrow materials approved by the Ministerial Representative. Compacted fill shall be installed along the entire width of the excavation.

- .8 Once the excavations have been completed, ask the Ministerial Representative to inspect their depth and dimensions. No filling can be carried out without the authorization of the Ministerial Representative.
- .9 Take all precautions needed to prevent damage to existing services.
- .10 If excavation and backfilling work is to be carried out in winter, the bottom of excavations must be protected against frost.
- .11 Road backfill shall be executed in conformity with the plans, details, normalised drawings, and article 11.6 – Backfill of the CCDG.

3.6 DEWATERING OF EXCAVATIONS

- .1 The Contractor must plan for all pumping work required keeping excavations dry. A pumping system must be installed when required and its capacity must be sufficient to drain surface water or water from infiltrations or leaks from the sewer pipes, water mains or other artificial elements. Precautions must be taken when the soil is silty or sandy, to avoid taking in fine particles. If need be, the Contractor must dig channels away from the foundations to carry water towards the manholes or ditches, so as to properly drain the soil prior to backfilling. To this end, the Contractor must refer to the geotechnical study.
- .2 Submit, to the Ministerial Representative, for verification, details of dewatering and heave protection methods, such as the installation of dikes, well points and sheet-pile cut-offs.
- .3 Before the start of pumping work, the Contractor must confirm the condition and capacity of ditches and storm or combined sewers into which the water is pumped. He is responsible for flooding and all property damage caused by the pumping of this water. The clean-up of accumulations of soil or other debris resulting from the pumping into existing pipes shall be at the Contractor's expense.
- .4 Install and operate the dewatering system so as to avoid lowering the level of the groundwater table outside the excavation to a point that could damage or threaten adjacent structures.
- .5 The Contractor shall, at his expense, put up, install and operate all equipment needed to keep excavations dry during construction.

- .6 In the event of an emergency (including breakdowns) an adequate pumping system in good working order must be available at all times. Moreover, workers capable of operating this system must also be available at all times.
- .7 If there is a risk of soil liquefaction or heaving, avoid excavating beneath the groundwater table. To avoid pipeline upheaval or excavation bottom heave, lower the level of the groundwater table or use other appropriate means.
- .8 Protect open-cut excavations against flooding and other damages, which could result from runoff.
- .9 All surface or groundwater, whether they are from natural sources, precipitation, melting snow, ice, infiltration, leaks or outflow from sewer pipes or other artificial element, must be drained, at the Contractor's expense. The Contractor is entirely responsible for water control, which must comply with prevailing municipal and provincial environmental regulations.

3.7 UNSTABLE SUB-BASE

- .1 Every time materials constituting the floor of an excavation, which has been brought to the level indicated on the drawings or the Ministerial Representative, are found to be too soft or, for whatever other reason, inadequate for supporting a pipe or other element to be built, the Contractor must excavate to a greater depth and build a special base, as required by the Ministerial Representative.
- .2 If the Ministerial Representative considers that the condition of the soil, which is soft or unsuitable for whatever reason, is due to unavoidable conditions, special base work can then be carried out by the Contractor, as instructed by the Ministerial Representative.
- .3 In the event that the Ministerial Representative considers that the condition of materials, which are soft or unsuitable for whatever reason, results from the Contractor's failure to adequately protect, handle and drain the worksite, or other negligence on the part of the Contractor, the latter shall, at his expense, excavate to the additional depth required of him, and fill the excavation in a satisfactory manner to the required level, even if unshrinkable fill or crushed stone is to be used, or if on the orders of the Ministerial Representative, other means are to be used to properly support the structure.

3.8 MAINTENANCE OF THE FILL SURFACE

- .1 The Contractor is required to keep the fill surface of trenches in good condition until the work has been accepted. Moreover, he is responsible, at all times, for accidents and damage caused to individuals, public or private property as well as vehicles. He is required to correct any sagging that might develop in the pavement and carry out all other work needed for the structure to be put into service or which might be required by the Ministerial Representative.
- .2 In an emergency, or if the Contractor has failed to carry out repairs deemed necessary and requested via a 48 hour written notice from the Ministerial Representative, the latter can have said work carried out by a third party, at the Contractor's expense.

3.9 COMPACTION

- .1 Generalities
 - .1 The compaction of materials seeks to increase their load-bearing capacity and prevent future settlement. Compacting operations shall be carried out at an ambient temperature above 0 °C in the case of cohesive soil, and it must be above - 6 °C in the case of granular soil, with the latter compacted before materials have reached a temperature below 0 °C.
 - .2 If the required compaction density is not achieved, the Contractor shall remove the excavation fill and restart compaction work using heavier equipment or increasing the number of passes. Repeat until the required compaction density has been reached.
- .2 Compaction equipment
 - .1 Compaction equipment must make it possible to achieve the stipulated material densities. Replace or reinforce equipment if such is not the case.
 - .2 All types of standard compaction equipment, in good working order, can be used to densify various soils as stipulated. It may be necessary to add mechanical rammers, scarifiers, harrows, rotary mixers, sprinklers, etc. depending on the work to be carried out.
 - .3 The Contractor must provide the Ministerial Representative with the characteristics of the compaction equipment he plans to use.
 - .4 However, the Ministerial Representative reserves the right to refuse any compaction equipment that is inadequate or unsuited to local conditions, the nature of the soil and materials used.

- .3 Compaction control
 - .1 Compaction control is ensured by the laboratory retained by the Owner. The Contractor must notify the Ministerial Representative twenty-four (24) hours in advance to have the required tests carried out.
- .4 Compaction levels
 - .1 This article deals with the level of compaction required for the natural soil and embankments. Embankments must be erected in successive layers, compacted separately and evenly.
 - .1 Compaction of the natural soil:
 - .1 The bottom cut and natural soil stripped of topsoil must be densified to a depth of 150 mm, to 90 % of Modified Proctor maximum dry density. If the bottom cut or the natural soil coincides with the infrastructure line, the first 150 mm beneath the infrastructure line must be densified to 95 % of Modified Proctor.
 - .2 Compaction of soil fills:
 - .1 Fill materials are densified to 90 % of Modified Proctor maximum dry density, except for the last 150 mm beneath the infrastructure line, which are densified to 95 % of Modified Proctor.
 - .3 Compaction of stone fills:
 - .1 Each layer beneath the infrastructure line must be compacted using four passes of a crawler tractor weighing a minimum of 30 tons. Over the top 300 mm layer, two additional passes using a vibratory roller with a minimum static weight of 5 tons and a centrifugal force of more than 10 tons are required. In the case of friable or foliated rock, each layer must be compacted in keeping with the compaction requirement of the last 300 mm layer.
 - .2 The fill must have a minimum density of 90 % of Modified Proctor maximum dry density, except for the last 150 mm below the infrastructure line, which shall be densified to 95 %.
- .5 Optimal water content
 - .1 Add or dewater as needed to maintain the materials' required water content and thus achieve the stipulated compaction.

- .2 The Contractor must strive to obtain, on the worksite, a water content allowing him to achieve the required density.
- .3 The Contractor shall supply the equipment needed to accelerate the drying of overly moist soil or moisten overly dry soil.
- .4 If the soil is too moist to allow even compaction to the required density, the Ministerial Representative may require that the soil be mixed with dry soil or dried by aeration or scarification.
- .5 If, on the other hand, the water content is inadequate, the Ministerial Representative can require watering to obtain a suitable content. The equipment required for this work is a 4 500 litre mobile tank fitted with a pressure or gravity release mechanism. The operator must be able to adjust the water distribution rate to ensure even distribution throughout the layer to be densified prior to compacting. If the surface is smooth, the Contractor shall use a scarifier or harrow to favor water penetration.
- .6 Density loss and reworking of the soil
 - .1 In the event that, before the end of the contract, the natural soil or a layer of materials already compacted according to specifications, should lose density due to the movement of equipment, poor weather, freeze-thaw cycle or any other reason, the Contractor shall be required to re-compact the soil to the required density, at his expense.
- .7 New targeted density
 - .1 When the compaction level does not meet criteria for acceptance and the Ministerial Representative is certain that this is not due to inappropriate operations by the Contractor or to his equipment, the Contractor can request that a new targeted density be established based on field tests:
 - .1 Establish a single field test on a uniform layer covering a surface area established on the worksite by the Ministerial Representative. The water content of materials tested must be close to the optimal water content (as measured using the NQ 2501-255 test method).
 - .2 Following the placement of the materials, run the compaction equipment over the full test surface six times. Determine densities and water content at three randomly selected sites. Calculate the dry density of each of the sites and use the average as the initial density value.
 - .3 Run the compaction equipment over the entire field test area two more times. Determine the densities and water content at

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- three other randomly selected sites. Calculate a new average dry density.
- .4 If the new average dry density does not exceed the initial value by more than 1 %, the compaction field test shall then considered to be satisfactory and complete. If the new average dry density exceeds the initial value by more than 1 %, additional runs of compaction equipment over the field test area will be conducted, in keeping with the above-mentioned procedure, until acceptance criteria have been met.
 - .5 Once compaction field tests have been completed, determine the densities and water contents at seven other randomly selected sites, then calculate the dry density at each of these sites. Calculate the average field test density based on the average of these seven values and the three final values determined by the field tests.
 - .6 The average dry density of the field tests becomes the new targeted density.
 - .7 The targeted density established based on field tests should be representative of the remainder of the layer, provided that the source and type of materials as well as the compaction equipment remain the same.

3.10 DISPOSAL OF WASTE MATERIALS

- .1 Generalities
 - .1 The Contractor shall load, transport and dispose of all waste material outside limits of Forillon National Park, at the location, which he shall select and which is suited to the disposal of said waste, in compliance with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
 - .2 Loading, transportation and disposal of waste are at the Contractor's expense.
 - .3 Materials from the deforestation and clearing of the zone affected by the work (such as trees, shrubs, bushes, branches, brush, stumps, dead wood, and other vegetation waste and materials containing demolition debris) or from the demolition of existing pavement, curbs, and sidewalks or existing underground installations, shall be disposed of at a site authorized for dry materials. The cost of sorting, handling and disposing of these materials shall be assumed by the Contractor.

- .4 If deemed necessary by the Ministerial Representative, the Contractor shall, for filling trenches, replace unusable materials with acceptable materials.

3.11 DISPOSAL OF EXCAVATION SURPLUS

- .1 Excavation surplus refused by the Ministerial Representative for the project's backfilling purposes can be disposed of at a site selected by the Contractor outside the limits of Forillon National Park, with the applicable local authorities. Once disposal has been completed, the materials must be leveled to the satisfaction of the owner(s) of the land. The Contractor must obtain a letter of authorization from each of the owners of the land covered by these provisions. A copy of this agreement and a Gaspé Town's authorization must be provided to the Ministerial Representative before material is transported.
- .2 All work covered by the preceding provisions shall be carried out in compliance with the directives and/or regulations of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy, which, in the event of contradiction, take priority over the preceding requirements.
- .3 All expenses related to any use whatsoever of the above-mentioned disposal and/or landfill site, including the obtaining of any permit and/or authorization, as well as the loading, transportation and disposal, shall be at the Contractor's expense.
- .4 All sites for the storage (excavation surplus excluding any refuse) considered within the framework of this contract must first be approved by the Ministerial Representative no later than the first worksite meeting. None of these materials can be disposed of until this approval has been obtained.
- .5 Part of the debris is used by the Contractor to carry out work covered by this contract. If excavation surplus is required by the Owner, the Contractor shall transport and spread this surplus material at his expenses, at designated locations within an overland radius of 8.0 km, as established by the Owner.
- .6 All excavation surplus and 1st and 2nd class debris not required by the Owner become the property of the Contractor.

- .7 The Contractor shall ensure that these materials are not disposed of in a flood zone and, prior to the start of the work, shall provide the Owner with a permit.
- .8 The Contractor is solely responsible for consequences resulting from the filling of one or more properties and possible claims or lawsuits from the property owners concerned, with regards to the levelling, the quality of debris materials, damages to trees, terraces, etc. The disposal of excavation surplus must not impede the natural drainage of the site.

3.12 ACCESS ROADS

- .1 Put in and maintain suitable roads providing access to the worksite.
- .2 The Contractor shall restore land used as an access road to its original condition.

3.13 RESTORATION WORK

- .1 Once work on the project has been completed, remove surplus materials and debris, trim slopes and correct defects identified by the Ministerial Representative.
- .2 Clean and restore areas damaged by the work, as directed by the Ministerial Representative.
- .3 Unless otherwise indicated, the ratio of embankment slopes will not be less than 1 V : 1.5 H.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 00 00 – Generalities (Civil)
- .2 Section 31 23 11 – Excavation and Backfilling

1.2 SCOPE OF WORK

- .1 The work shall include, without being limited to, supplying the materials and manpower required for the execution, according to good engineering practices, of the environmental management and disposal of excavation surplus, in compliance with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy and prevailing municipal by-laws. Additionally included:
 - .1 Taking of samples by a recognized environmental firm,
 - .2 Chemical analysis of these samples by a laboratory accredited by the MDDEFP,
 - .3 The borehole rate is 1/625 m²,
 - .4 The sample rate is 1 per horizon encountered in the boreholes,
 - .5 Parameters to be analyzed will be: PAH, PH C10-C50, metals (13 elements),
 - .6 The excavation, loading, transportation and disposal of excavation surplus to a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy,
 - .7 The manual segregation and temporary storage of waste contained in excavated materials,
 - .8 If required, the installation of temporary piles, including the polythene fabrics of 6 mils covering the piles,
 - .9 The disposal of excavated contaminated soil on authorized sites or their transportation for reuse as directed by the Ministerial Representative,
 - .10 Supply of the weigh bills of each enumerated range and the weighing machine calibration certificate,
 - .11 The surveying of work zones, excavation boundaries and bottoms, and restored zones,
 - .12 Cleaning of each truck's box,

- .13 Providing the permits and documents attesting the site's compliance to MDDEFP,
- .14 All other work required for the complete production of these structures.

Part 2 Products

2.1 SAMPLING

- .1 The environmental management of excavation surplus includes the sampling of soil samples by a recognized environmental firm and the chemical analysis of these samples by a laboratory accredited by the MDDEFP.
- .2 Parcels of land to be decontaminated and estimated volumes of the different materials to be excavated were established during the environmental site assessment and are presented in the geotechnical study annexed with the contact documents.
- .3 The Contractor shall perform one sample per 625 m². He must sample and analyze one sample per horizon encountered in the borehole(s). The location of the boreholes shall be determined by the Ministerial Representative on the work site.
- .4 For each sample, the Contractor shall have an analysis conducted for the following parameters:
 - .1 Petroleum hydrocarbons (C10-C50),
 - .2 Polycyclic aromatic hydrocarbons (PAH),
 - .3 Metals (13 elements).
- .5 Results obtained shall be compared with the generic contamination criteria of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .6 Excavation materials below criteria A and excavation materials within the A-B range can be reused as excavation fill, providing they comply with the previously listed criteria.
- .7 Excavation materials within the A-B that could not be re-used as backfilling materials in this project must be disposed of at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.

- .8 Excavation materials within the B-C range must be disposed of at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .9 Excavation materials above the criteria C must be disposed of at a site complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
- .10 The Contactor shall carry out sampling and analyses at least one week prior to any excavation work, since no excavation work can be authorized until results have been transmitted to the Ministerial Representative.

Part 3 Execution

3.1 DISPOSAL OF CONTAMINATED EXCAVATION MATERIALS

- .1 The Contractor must refer to la section 31 23 11 - Civil - Excavation and Backfilling.

3.2 ABBREVIATIONS AND DEFINITIONS

- .1 Generalities
 - .1 Should contaminated materials be detected during construction, these excavated materials shall be managed and disposed of in compliance with prevailing environmental and municipal regulations.
- .2 Abbreviations and definitions
 - .1 Waste: Refers to any material to be excavated by the Contractor, which corresponds to definitions contained in the Regulation respecting solid waste or the Regulation respecting hazardous materials, administered by Quebec's MDDEFP (Ministry of Sustainable Development, Environment, Fauna and Parks).
 - .2 Soil to be excavated: Refers to any soil that must be excavated by the Contractor at locations and depths determined by the Owner.
 - .3 A-B Soil: Refers to soil whose contamination concentrations fall within the A-B range as defined by the generic criteria of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
 - .4 B-C Soil: Refers to soil whose contamination concentrations fall within the B-C range as defined by the generic criteria of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.

- .5 >C and < Soil : Refer to soil whose contamination concentrations exceed generic C criteria as defined by the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy and falls below the standards of the Regulation respecting the burial of contaminated soils.
- .6 Soil whose chemical and geotechnical characteristics are acceptable: Refers to soil from restoration work, which has been temporarily stored on the site itself or on an outside site, whose components are mineral in nature and whose contamination concentrations do not exceed permissible levels shown in the Table for the Management of Contaminated Excavated Soils included in the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy, in compliance with this section's "Backfilling Materials" article.

3.3 TEMPORARY STORAGE

- .1 It is important to note that the work site shall be used for the temporary storage of piles of excavated soil. Debris must never be piled more than 1 meter in height, to ensure visibility and security, except if done temporarily within the work day.

3.4 LEGISLATION

- .1 The Contractor must carry out all soil and groundwater restoration work in compliance with the following guides, guidelines, standards and regulations:
 - .1 MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.
 - .2 MDDEFP's guides and guidelines.

3.5 EXCAVATION OF CONTAMINATED SOIL

- .1 Should contaminated soil be encountered, the Contractor shall conduct excavation work in a methodical fashion, which provides the control required for environmental follow-up. He shall carry out selective excavations, as directed by the Ministerial Representative.
- .2 The Contractor must consider that the Ministerial Representative must be present throughout the duration of excavation work and that the latter can, at any time, stop work in a sector to carry out observations, samplings and analyses. The Contractor shall provide all collaboration required for the smooth execution of the work, to ensure that all contaminated soil is removed and disposed of in an adequate manner. In this regard, it is possible for changes and modifications of the elevations to occur as excavation work progresses with regards to the contaminated soil to be excavated.

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3.6 MANAGEMENT OF EXCAVATED MATERIALS

- .1 When required, excavated soil shall be temporarily stored on polyethylene tarps. Soil shall also be covered with a polyethylene tarp. Tarps must be of "Extra Strong" calibre, 6 mils thick and well anchored.
- .2 Debris must never be piled more than 1 m in height, to ensure visibility and security, except if done temporarily within the work day.

3.7 SAFETY

- .1 The Contractor must, at his own expense, prevent excavations from collapsing. To this end, the contractor must maintain stable slopes required for the proper execution of the work and the protection of workers on the jobsite.
- .2 The Contractor shall take measures needed to ensure that the piles of materials as well as the work do not impede traffic and transportation. The Contractor must use a work method that allows the confinement of contaminated soil to specific areas, in order to limit the risk of contaminating clean zones.

3.8 DISPOSAL OR TREATMENT OF CONTAMINATED SOIL

- .1 Contaminated soil, which cannot be reused as fill material on the site, shall be shipped for disposal or treatment to an authorized site. Weigh bills given to the driver by the treatment or disposal site shall be handed to the Ministerial Representative.
- .2 Truck boxes shall be fitted with removable hoops and watertight tarps firmly secured to the walls.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 00 – General (Civil)
- .2 Section 31 11 00 – Clearing and Grubbing
- .3 Section 31 23 11 – Excavation and Backfill
- .4 Section 32 11 00 – Civil Roadwork
- .5 Section 33 31 00 – Pluvial - Culverts
- .6 Section 32 91 21 – Topsoil Placement and Grading

1.2 REFERENCES

- .1 Ministère des Transports du Québec :
 - .1 Cahier des charges et devis généraux du ministère des Transports du Québec, dernière édition, CCDG 2015.
 - .2 Cahiers des normes, Ouvrages routiers, dernière édition
- .2 Pêches et Océans Canada
 - .1 Mesures visant à éviter les dommages causés au poisson et à son habitat

1.3 DEFINITIONS

- .1 Rock: Any massive block of material, except for frozen materials, whose volume exceeds 1 m³ and that cannot be removed using a heavy duty excavator equipped with a 0.95 to 1.15 -m³ capacity shovel.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submittals related to blasting work (blasting): submit to Departmental Representative written documentation regarding proposed blasting work for rock excavation.
 - .1 The document must indicate the proposed work method, types and quantities of explosives to be used, loading rates and blasting methods, types of detonators, blasting techniques, protective

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measures against rock fragments, vibrations, dust and noise. The document must detail protective measures to be implemented, date and time of blasts and any other relevant information.

- .2 Keep updated, precise and detailed survey and blasting logs and submit to Departmental Representative at the end of each work shift.
- .3 Sustainable development certificate
 - .1 Waste Management: Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .3 Erosion and sediment control: Submit copy of erosion and sediment control plan prepared for the project, specifying what measures will be taken.
- .4 Qualifications of explosives expert
 - .1 Hire a certified explosives expert to prepare and supervise blasting work, interpret report recommendations prior to commencing blasting work, and determine appropriate precautions, preliminary work and blasting techniques.
 - .2 Submit documents certifying expert competencies.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Refer to Art. 11.4 of the MTQ's *Cahier des Charges et Devis Généraux – Infrastructures Routières*, most recent version.

1.6 QUALITY ASSURANCE

- .1 Blasting and vibration control
 - .1 Refer to Art. 11.4 of the MTQ's *Cahier des Charges et Devis Généraux – Infrastructures Routières*, most recent version.

Partie 2 Products

2.1 MATERIALS

- .1 Refer to Art. 11.4 of the MTQ's *Cahier des Charges et Devis Généraux – Infrastructures Routières*, most recent version.

Partie 3 Execution

3.1 EXCAVATION DANS LE ROC

- .1 Coordinate instructions outlined in this section with those of Section 01 35 29 - Health and Safety.
- .2 Carry out rock excavation work according to indicated alignments, sections and profiles.
- .3 Blasting is permitted when needed but must comply with specified requirements.
 - .1 Perform blasting work in accordance with local and provincial codes and requirements of competent authorities, including those outlined in Art. 11.4 of the MTQ's *Cahier des Charges et Devis Généraux – Infrastructures Routières*, most recent version.
- .4 Perform excavation work using techniques aimed at minimizing the amount of excavated materials, not exceeding allowable limits and avoiding possible damages to adjoining structures and work.
- .5 Excavate into rock so as to achieve the slope recommended in the geotechnical report.
- .6 To ensure proper adherence of concrete, prepare rocky surfaces by trimming, power washing and sweeping.
- .7 Use presplit blasting, cushion blasting or any other perimeter blasting technique unless specified otherwise by the Departmental Representative.
- .8 Remove large stones and rock fragments from the excavated area to prevent them from sliding.

3.2 PROTECTION OF THE FISH AND FISH HABITAT

- .1 The entrepreneur will not cause the mortality of the fish by the use of explosives in the water or near the water. If the use of explosives is required, use the measures to set up found on the web site of Fisheries & Oceans Canada under the column «Measures to Avoid Causing Harm to Fish and Fish Habitat», To reduce the the minimum the potential repercussions on the fish and the fish habitat.
- .2 Internet link of the Program of the fish protection: <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html>

3.3 CLEANING

- .1 Clean in accordance with Section 01 74 11 – Cleaning.

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- .2 Elimination of excavated materials
 - .1 Remove surplus excavated rock from site in accordance with Art. 11.4.3.2 of MTQ's CCDG 2015.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 – Excavating and Backfilling
- .2 Section 31.37.00 – Riprap

1.2 REFERENCES

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

- .4 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation*, most recent version.
 - .2 *Ouvrages routiers, Normes, Tome VII – Matériaux, norme 13101, Géotextiles*, most recent version.

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 geotextile and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports
 - .1 At least four (4) weeks prior to start of Work, provide number of required copies of test results and certificates.
 - .2 Construction Waste Management
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .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 geotextiles so as to protect them against direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.

Partie 2 Products

2.1 MATERIALS

- .1 Type III and V geotextiles in accordance with MTQ Standard 13101, made of synthetic needle-punched non-woven fibre and supplied in rolls.
 - .1 Width: 3.5 m minimum.
 - .2 Length: 100 m minimum.
 - .3 Polypropylene or polyester.

- .2 Anchor screws and washers anchor: to CSA G40.21, 300 W grade, hot dipped galvanized, minimum zinc coating of 600 g/m², to ASTM A123/A123M.

Partie 3 Execution

3.1 VERIFICATION

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

3.2 INSTALLATION

- .1 On level surfaces, install geotextiles by unrolling them in accordance with indicated direction, method and location. Secure them using anchor screws.
- .2 Install geotextiles so as to achieve flat and even surface free of buckles and tightly-pulled sections.
- .3 On sloped surfaces, install continuous strips of geotextiles, starting from the foot of the slope up to the highest point.
- .4 Overlap previously laid geotextile strips by 600 mm.
- .5 Secure geotextile strips using anchor screws every 1,000 mm at center of overlapping area.
- .6 Prevent geotextile displacement and protect against damage and deterioration before, during and after the installation of riprap.
- .7 Remove protective layer within four (4) hours following the installation of geotextiles.
- .8 Replace damaged or deteriorated geotextiles to the Departmental Representative's satisfaction.

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

3.4 PROTECTION

- .1 Do not allow vehicular traffic directly on geotextiles.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 35 43 – Environmental Procedures.
- .2 Section 31 32 19.01 – Geotextiles.

1.2 REFERENCES

- .1 Quebec Ministry of Transportation (MTQ)
 - .1 *Cahier des charges et devis généraux (CCDG) – Infrastructures routières – Construction et réparation*, most recent version.
 - .2 *Ouvrages routiers, Normes, Tome VII – Matériaux*
 - .1 *Norme 14501 Enrochement et revêtement en pierres*

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.

Partie 2 Products

2.1 STONES

- .1 Riprap must be made of hard, dense and resistant quarry stones, minimum relative density of 2.6, and free of cracks, fissures and other defects.

2.2 GEOTEXTILES

- .1 Geotextiles: in accordance with Section 31 32 19.01 – Geotextiles.

Partie 3 Execution

3.1 INSTALLATION

- .1 When installing riprap on an embankment, dig a trench at the foot of the embankment according to specified dimensions.
- .2 Install geotextiles on the prepared surface in accordance with Section 31 32 19.01 – Geotextiles and instructions provided. Be careful not to perforate the geotextile and do not allow vehicular traffic on covered surfaces.
- .3 Create riprap to specified thickness and in accordance with instructions provided.

- .4 Stones must be carefully placed, set and tightened in all directions according to the requested slope. No irregularities above the centre line of an average-sized stone.
- .5 Stones must be placed as approved by the Departmental Representative in order to achieve a solid and stable surface. Place the biggest stones at the bottom of the embankment.
- .6 The Contractor must install riprap in the watercourse up to the minimum elevation of the one hundred year flood line before the end of the environmental restriction period (September 16).

END OF SECTION

PARTIE 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 00 00 – General (Civil)
- .2 Section 31 23 11 – Excavation and Backfilling
- .3 Section 31 32 19.01 – Geotextiles
- .4 Section 32 91 21 – Topsoil and Earthwork
- .5 Section 33 31 00 – Civil- Culvert

1.2 SCOPE OF WORK

- .1 Supervise work and supply all labour, equipment, tools, materials, transportation and other services required to execute and complete all work described and specified in the present section and in the contract documents, including but not limited to: supplying and laying an asphalt road in compliance with the lines, thicknesses, levels and profiles indicated on the contract drawings or as specified by the Ministerial representative.
- .2 In addition, supplying, laying and compacting one or more layers of asphalt concrete mixed in a central plant and laid over a bridge deck slab in compliance with the lines, thicknesses, levels and profiles indicated on the contract drawings or as specified by the Ministerial representative.

1.3 REFERENCES

- .1 Quebec Standards Office (BNQ).
 - .1 *BNQ 2501-170: Sols – Détermination de la teneur en eau*
 - .2 *BNQ 2501-255: Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN.m/m³)*

.3 *BNQ 2560-114: Travaux de génie civil – Granulats*

- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM E1710: Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Reflectometer.
- .3 Quebec Ministry of Transportation (MTQ):
 - .1 *Cahier des charges et devis généraux (CCDG) – Infrastructures routières – Construction et réparation.*
 - .2 *Cahiers des normes, Ouvrages routiers, Tome I « Conception routière », latest edition.*
 - .3 *Tome II de la collection Normes – Ouvrages Routiers du MTQ « Construction routière ».*
 - .4 *Dessin normalisé II-2-008 – Raccordement des revêtements en enrobé (Épaisseur du nouveau revêtement supérieure à l'épaisseur du revêtement existant).*
 - .5 *Tome V de la collection Normes – Ouvrages Routiers du MTQ « Signalisation routière ».*
 - .6 *Tome VII de la collection Normes – Ouvrages Routiers du MTQ « Matériaux ».*
 - .7 *Norme 2101 - Granulats.*
 - .8 *Norme 2102 - Matériaux granulaires pour fondation, sous-fondation, couche de roulement granulaire et accotement.*
 - .9 *Norme 4101 - Bitumes.*
 - .10 *Norme 4105 - Émulsions de bitume.*
 - .11 *Norme 4202 - Enrobés à chaud formulés selon la méthode de formulation du Laboratoire des chaussées.*
 - .12 *Norme 4401 – Produits de colmatage de fissures et de joints*
 - .13 *Norme 10202 - Produits de marquage de moyenne durée*

.14 *Norme 13101 - Géotextiles.*

.15 *Norme 14601 - Microbilles de verre pour peinture servant au marquage des routes.*

.16 *Tome VIII de la collection Normes – Ouvrages Routiers du MTO
« Dispositifs de retenue ».*

1.4 WORK PERFORMED BY OTHER COMPANIES OR CONTRACTORS

- .1 Where applicable, the Contractor shall coordinate its work with that of any other Contractor, company or public utility that needs to perform work of any nature whatsoever, before or during the period of work covered by the present contract.

1.5 INSPECTION AND TESTING

- .1 The Owner shall pay the laboratory's inspection and testing fees. If any tests shall be repeated due to the discovery of non-conformities, the tests shall be repeated at the Contractor's expense. The Contractor shall advise the laboratory and the ministerial Representative at least 48 hours before proceeding with the work and the Contractor shall ensure that a representative of the laboratory is present before performing work requiring inspection or testing. The ministerial Representative reserves the right to take samples at any time.
- .2 Granulometric analysis: road fill materials are tested by the laboratory to determine if they are suitable for their intended use and compliant with specifications.
- .3 Wet density analysis: in the event of doubt as to the target values for material density or at the request of the ministerial Representative, the laboratory will sample aggregate delivered to the work site to validate maximum densities using test method BNQ 2501-255: *Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN.m/m³)*. Otherwise, target densities will be based on the results of tests done in accordance with standard BNQ 2501-255 by the laboratory of the material manufacturer.
- .4 Compaction tests: compaction tests shall be performed on each aggregate material layer in order to verify that specified compactness

has been reached. The Contractor shall assist in the performance of such tests and may not claim compensation for work stoppages or other losses of time resulting from performance of such tests.

- .5 Verification of hot mix: The laboratory will sample hot mix, five (5) matched samples, using test method LC 26-005 for materials control purposes. Acceptance of materials will be based on the requirements and tolerances prescribed in standard 4202. Sample testing will consist in analyzing the following parameters:
 - .1 Bitumen content (LC 26-100 or LC 26-006)
 - .2 Maximum density (LC 26-045)
 - .3 Determination of percentage of voids (LC 26-320)
 - .4 Particle size analysis of extracted aggregate (LC 26-007)
- .6 Verification of compaction of hot mix paving: verification of compaction of hot mix paving will be done with a moisture density gauge calibrated in accordance with ASTM D 2950 – Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods, or by concordance of tests, moisture density gauge versus core sample density, performed at least once a year, per type of hot mix on an average of at least six core samples to determine the correction of the density obtained with the device used. The degree of asphalt compaction is calculated at the work site from the raw density measured after compaction of the asphalt and the maximum density indicated on the final mix formula.
- .7 The laboratory shall provide the ministerial Representative progressive reports confirming that it has performed all tests ordered and that the test results are consistent with the drawings and specifications. In addition, the laboratory shall provide the ministerial Representative with a final report confirming that all fill material is consistent with the drawings and specifications and that no laying of concrete or pavement was authorized before delivery of the report, unless otherwise stated by the Representative of Parks Canada.
- .8 For acceptance of marking work, the Owner reserves the right to verify the reflection of marking products using a device conforming to ASTM E1710.

1.6 SUBMITTALS

.1 Aggregates:

- .1 Depending on the source of supply, Contractor shall submit test results for compliance with BNQ 2501-255: *Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN.m/m³)*.
- .2 Depending on the source of supply, Contractor shall submit test results and compliance certificate attesting that proposed aggregates meet the requirements of BNQ standard 2560-114: *Travaux de génie civil – Granulats* and the present section.
- .3 Holdback for failure to submit statement of conformity prior to shipment; placement of roadbed materials at the work site before submitting to the supervisor all the test results required by these specifications will result in a permanent holdback of \$5,000 per day for each day of shipment before all test results are received.

.2 Tack coat

- .1 For each delivery of bitumen, the Contractor shall submit a statement of conformity as prescribed in MTQ standard 4105. At the time of shipment, the following information shall be added to the statement of conformity:
 - .1 Contractor name;
 - .2 Shipper name, and for bulk materials, the tank number;
 - .3 Date loaded;
 - .4 Quantity delivered.
- .2 Submit the method of application and control.

.3 Bitumen

- .1 For each source of bitumen used to prepare hot mix, submit statements of conformity as prescribed in MTQ standard 4101.

- .4 Asphalt concrete mix
 - .1 Submit to the ministerial Representative for approval theoretical and final proportioning formula for the asphalt concrete mix together with test results for the mix, at least one (1) week before the beginning of work.
 - .2 The hot mix theoretical formula shall be dated and signed by the manufacturer's quality control officer. One theoretical formula per type of asphalt mix shall be produced for each type of binder or each change in source of aggregate supply. The characteristics indicated in the formula shall be representative of the hot mix that will be placed and shall conform to the requirements of standard 4202 for hot mixes formulated according to the MTQ pavement laboratory formulation method.
 - .3 **Holdback for failure to submit statement of conformity**
 - .1 Placement of bituminous concrete at the work site before submitting to the supervisor all the test results required by these specifications will result in a permanent holdback of \$5,000 per day for each day of shipment before all test results are received.
- .5 Road marking products
 - .1 At least 7 days before starting work, the Contractor shall submit the information and data sheets mentioned in article 17.2.1.1 of the CCDG.
 - .2 For each delivery of marking products, the Contractor shall submit a statement of conformity containing the information mentioned in article 17.2.3.2.1 of the CCDG.
- .6 Road marking subcontractor
 - .1 The road marking subcontractor shall submit a list of the marking work performed for MTQ in the previous two years.

.7 Glass micro-beads

- .1 For each delivery of glass micro-beads, the Contractor shall submit a statement of conformity containing the information mentioned in article 17.2.3.2.2 of the CCDG.

.8 Geotextile

- .1 Refer to the section 31 32 19.01 Geotextiles

.9 Guardrails

- .1 The Contractor shall submit statements of conformity for all guardrail components, in accordance with the applicable articles of sections 18.5.2 and 18.7.2 of the CCDG.
- .2 End devices shall be included in the most recent edition of the list of products approved under the MTQ program HOM 5660-101.
- .3 The Contractor shall submit a written statement certifying that each approved end device was installed in accordance with the assembly drawing and the manufacturer's installation manual. The statement shall be signed by the Contractor and shall contain the following information:
 - .1 Location of end device;
 - .2 Model;
 - .3 Date of inspection;
 - .4 List of checks carried out at time of installation.

.10 Erosion control mats

- .1 Submit the product data sheet for the biodegradable coconut fibre netting as required in Section 01 33 00 – Submittals.

.11 Small signboards

- .1 At least 10 days before starting work on the installation of small signboards, the Contractor shall submit shop drawings for each signboard for approval.

1.7 DELIVERY TICKETS

- .1 Each load delivered to the site shall be accompanied by a delivery ticket in duplicate. The ministerial Representative shall sign one copy as a receipt for the Contractor and keep the other copy.

1.8 SCOPE OF WORK

- .1 Work involving paved roads involves but is not limited to supplying the materials and labour required to complete the construction of a road according to established engineering practice, including:
- .1 Saw cuts and planing over the distance required for connecting the asphalt;
 - .2 Excavation of the existing materials to the subgrade line required;
 - .3 The loading, transportation and disposal of excavation waste;
 - .4 Removal of existing guardrails and culverts;
 - .5 Reconstruction of existing shoulders outside the limits of road reconstruction to install guardrail platforms;
 - .6 Preparation of subgrade and, where required, reconstruction of ditches adjacent to the work;
 - .7 Supply and installation of geotextile;
 - .8 Supply and construction of roadbed subbase and base course;
 - .9 Supply and installation of semi-rigid guardrails on wood posts, including approved end devices;
 - .10 Preparation of aggregate surface, including decontamination where required;

- .11 Joining to the pavement and guardrails on the Bridge;
- .12 Supply and placement of asphalt paving;
- .13 Supply and installation of tack coat between courses of asphalt paving;
- .14 Supply and placement of asphalt paving on a structure;
- .15 Road marking;
- .16 Supply and installation of small signage;
- .17 Supply and installation of posts and bases for National Parks signage.

PARTIE 2 - PRODUCTS

2.1 GEOTEXTILE

- .1 Geotextiles installed on the subgrade shall be type III and shall meet the requirements of MTQ standard 13101 and the section 31 32 19.01. Geotextile.

2.2 AGGREGATES FOR SUBBASE, BASE COURSE AND SHOULDERS

- .1 Aggregates used for the subbase (MG-112), base course (MG-20) and shoulders (MG-20) shall meet the requirements of MTQ standards 2101 and 2102.

2.3 ASPHALT PAVING

- .1 General
 - .1 Asphalts and bitumen shall be manufactured by a business operating an asphalt plant that holds a registration certificate issued by a certification body accredited by the Canadian Standards Council or by a recognized accreditation organization which certifies that it has a quality system conforming to ISO standard 9001:2008 Quality systems – Model for quality assurance in design, development, production, installation and servicing.

- .2 Hot mixes shall be formulated in accordance with standard 4202 – Hot mix formulated according to the pavement laboratory formulation method.
- .3 Materials containing slag and/or residue from a blast furnace shall not be used in any asphalt mix.

.2 Bitumen

- .1 The requirements as to the characteristics of and evaluation criteria for bitumen are consistent with the requirements of MTQ standard 4101.
- .2 The performance class of the bitumen used to produce asphalt mixes is PG 64-34.

.3 Aggregates

- .1 Aggregates used for preparation of asphalt mixes shall meet the requirements of MTQ standard 4202.
- .2 Intrinsic and manufacturing characteristics are as follows:

| AGGREGATE SIZE | INTRINSIC CHARACTERISTICS CATEGORY | MANUFACTURING CHARACTERISTICS CATEGORY |
|-----------------------|---|---|
| Coarse | 3 | C |
| Fine | 2 | |

.4 Other characteristics

- .1 For hot mix asphalt formulated using the pavement laboratory method (MTQ standard 4202) to be in conformity, it shall also meet the following criteria:
 - .1 In results of analysis for the first screen, in which retained material is permitted, the percentage of material passing through the screen shall not be under the minimum requirement indicated in Table 4202-1 of MTQ standard 4202 by more than 3%, and the requirement of 100% of material

passing through the next largest screen shall be met as stipulated in the same table;

- .2 The Marshall voids percentage greater than 1.0% and not differing by more than 1.5% from the average Marshall voids percentage obtained upon evaluation during production of theoretical formulas and establishment of final formulas be required or obtained;

or

- .1 Percentage voids indicated in Table 4202-1 of MTQ standard 4202 using a rotary shear press for each number of rotations required or obtained.
- .3 In the event that one of these criteria is not met, each sample that failed to meet one or more criteria is to be analyzed separately for compliance with the requirements of Table 4201-1 of MTQ standard 4201 in order to identify the source of bias. The ministerial representative reserves the right to reject the work and have it re-done by the Contractor.
- .4 All asphalt mixes that do not meet the requirements stated in the drawings and specifications shall be deemed defective.

2.4 BINDER

- .1 The binder is a fast-curing RS-1 type bituminous emulsion. The binder shall meet the requirements of MTQ standard 4105. Supply of the binder shall meet the requirements of the MTQ's general specifications (CCDG).

2.5 LIQUID DUST-CONTROL AGENT

- .1 Dust control shall be done with water only.
- .2 Water used in dust control shall contain no waste or organic matter.

2.6 ROAD MARKINGS

.1 Paint

- .1 The marking products used shall be included in the most recent edition of the approved products list prepared under the MTQ program HOM 8010-100.
- .2 The paint used for painting markings shall meet the requirements of MTQ standard 10202 – Products for medium service life markings.
- .3 All paint used for road markings shall be from a batch produced during the same year as the work.
- .4 Barrels shall be labelled in accordance with standards for the identification of hazardous materials.

.2 Glass micro-beads

- .1 Micro-beads shall meet MTQ standard 14601 – *Microbilles de verre pour peinture servant au marquage des routes*.
- .2 The Contractor shall use a product which is included in the most recent edition of the approved products list prepared under the MTQ program HOM 8010-100 and which is suitable for the conditions of use (non-illuminated site, short-term marking, marking colour, etc.).

.3 Adhesive delineators

- .1 The reflective film on the adhesive delineators for temporary pavement markings shall be type XI conforming to MTQ standard 14101.

2.7 GUARDRAILS

.1 Semi-rigid guardrails

- .1 Guardrails are semi-rigid GSR type and wood posts with steel cables as indicated on standardized drawing VIII-3-GSR001.

- .2 A type 1 end device, with lateral deviation, on wood posts, is used at the start-point of semi-rigid guardrails. The end device shall be 15.24 m long and shall be included in the most recent edition of the approved products list prepared under the MTQ program HOM 5660-101.
 - .3 The wood used to build guardrails shall conform to MTQ standard 11101.
 - .4 The bolts, anchor rods, nuts and washers shall conform to standard ASTM A307, grade A and to MTQ standard 6201.
 - .5 Nails shall be galvanized and shall conform to standard ASTM F1667.
 - .6 The formed steel rails, end devices and steel washers shall conform to MTQ standard 6301.
 - .7 Galvanization of elements shall conform to standard ASTM A123/A123M
 - .8 Reflective films shall be type XI as prescribed in MTQ standard 14101.
- .2 Semi-rigid transition guardrails
- .1 Semi-rigid lateral transition guardrails are:
 - .1 TL-3 rigidity transition
 - .2 W-section steel
 - .3 On wood posts
 - .4 As prescribed in standard drawing VIII-3-GSR-010A
 - .2 Connection to type 210 D bridge guardrails shall conform to standard drawing VIII-3-024.
 - .3 The connecting plate shall conform to standard drawing VIII-3-025.
 - .4 The standards applicable to materials are indicated in the standard drawings.

2.8 CORRUGATED GALVANIZED STEEL PIPE FOR ELECTRICAL CONDUIT

- .1 CGSP for electrical conduit shall be 150 mm in diameter and have a polymer covering. Installation shall be done in accordance with section 33 31 00 – Culverts.

2.9 SMALL SIGNAGE POSTS

- .1 Small signage posts shall conform to MTQ standards for structure type L6 (steel posts), i.e., for roadside signage.

2.10 SMALL SIGNBOARDS

- .1 Small signboards are made from an aluminum alloy that shall comply with the requirements of standard 6401 from *Tome VII – Matériaux* of MTQ. Panel dimensions and tolerances shall comply with the requirements established in the MTQ standards for road works.
- .2 The thickness of aluminum plate used depends on the dimension of the longest side of the panel (mm) and the dimensions shall meet MTQ standards.
- .3 The reflective sheeting and the colours used shall comply with the requirements of the standards of *Tome V – Signalisation routière* and 14101 Standard *Volume VII - Materials* from MTQ's *Cahier des normes, Ouvrages routiers*. Unlike what is stated in *Tome V*, the reflectivity level of reflective films shall meet the new ministerial guidelines issued July 31, 2009 by the Ministry.
- .4 Logos, pictograms and characters shall be silkscreened according to the MTQ standards.
- .5 The Contractor shall follow the instructions of the reflective film manufacturer for storing panels if they cannot be installed right after manufacture.
- .6 Unless otherwise specified, the lettering shall meet the requirements of the Standard Alphabet for Highway Signs.

2.11 FORILLON NATIONAL PARK SIGNAGE

- .1 Signs for Forillon National Park will be supplied by the Owner.
- .2 The hardware for mounting the signs on posts will also be supplied by the Owner.

2.12 SIGNAL ARROWS (LIGHTED)

- .1 The signal arrows have to be in accordance with the point 4.37, the chapter 4 of the Volume V.
- .2 The signal arrow has to be yellow color on an orange background.
- .3 The reflective film has to be of type III and a black screen of visibility around the bright message must be kept, as it is indicated to figure 4.37-1 of the Volume V.
- .4 Characteristics of the arrows of road marking

| Utilisation | Minimal width (A) | Minimal height (B) | Minimal Height Of the ground (C) | Minimal Diameter Of the Optical units (D) | minimal number Of the Optical units | Minimal Angles Of Readability (\pm° of the <u>Main axel</u>) | Minimal distance Of Readability |
|---------------------|-------------------|--------------------|----------------------------------|---|-------------------------------------|---|---------------------------------|
| Autres utilisations | 1500 mm | 600 mm | 1500 mm | 100 mm | 14 | $\pm 20^\circ$ | 600 m |

2.13 SHOULDERS

- .1 Shoulders are made of compacted MG-20b rock, 120 mm wide, and shall have a uniform width, as specified in the drawings and cross-sections. The work is done after the placement of each layer of asphalt mix (base and surface courses), once the pavement has cooled to below 50° C. Payment is made only once.
- .2 The Contractor can use materials from leveling as shoulder filling material.

2.14 INSULATION

- .1 Thermal insulation is extruded polystyrene. Installation shall conform to DN II-2-029.

PARTIE 3 - EXECUTION

3.1 GENERAL

- .1 The construction of bases and pavement shall be done after spring thaw, once the site is completely free of snow-melt runoff water. The preparation and laying of asphalt mixes shall be done in favourable weather and at an ambient temperature suitable for producing a smooth surface meeting the requirements of these specifications. It is not permitted to operate when moisture in aggregates affects the temperature of the mix or the pace of operations, or when the base is soaked or covered with puddles or mud. The temperature of the surface to be paved shall be at least 10°C and rising for a layer thickness of less than 50 mm. When the surface temperature drops below 7°C, no surface course may be laid without the written permission of the Departmental Representative. At all times, the mix shall be compacted until it reaches the specified density. No surface mix is to be laid after September 26 for layers less than 50 mm and October 24 for layers greater than 50 mm, without the Departmental Representative's permission.

3.2 PREPARATION OF SUBGRADE

- .1 Preparation of the subgrade shall be done after the excavation and backfilling work described in Section 31 23 11 – Civil - Excavation and Backfilling.
- .2 Preparation of the subgrade includes the earthwork required to create a platform on which the road structure will be built as indicated on the drawings. The subgrade shall be shaped so as to allow the roadbed to drain towards the ditches. The subgrade shall be smooth and free of ruts and depressions.
- .3 The surface to be prepared must be completely drained beforehand and for the duration of preparation work. If there are small uneven spots, deviating less than 50 mm from the required profile, it is sufficient to level

the entire surface with a grader, then to compact the surface with the appropriate equipment. If the surface is rough or uneven, the Contractor must first scarify it to the level of the bottom of the depressions, level, and compact again.

- .4 The evenness of the surface, in both longitudinal and transverse directions, shall be verified before the subbase is constructed and any deviation exceeding 30 mm from the level required shall be corrected.
- .5 Surplus materials from the preparation of the subgrade shall be managed as surplus excavated material and in accordance with Section 31 23 11 – Civil - Excavation and Backfilling.
- .6 If it is impossible to create a uniform, even and stable surface due to the presence of deleterious materials in the subgrade, those materials shall be dried or excavated and replaced.
- .7 After the subgrade is compacted and shaped, the Contractor shall proceed with construction of the roadbed as soon as possible.

3.3 ALIGNMENTS AND LEVELS

- .1 All work shall be done in accordance with the alignments and levels indicated in the drawings. However, the longitudinal and transverse lines of the road surface at the boundaries of the work, i.e., where the new asphalt pavement is to be connected to the existing pavement, shall be adjusted on-site.

3.4 PAVEMENT STRUCTURE

- .1 Structure of temporary roads
 - .1 When traffic is detoured via a temporary road lying outside the existing roadbed, the Contractor shall supply a temporary road structure consisting, at a minimum, of a base of type MG-20 aggregate 450 mm in thickness.
 - .2 The minimum width of temporary roads shall be 4.5 metres if carrying one-way traffic and 7 metres if carrying two-way traffic.

- .3 Where traffic is to be carried on an aggregate-surface road, the Contractor shall maintain that road. Such maintenance shall consist in grading or refilling the road surface at least once a week or after weather events.
 - .4 Localized depressions exceeding 100 mm shall be corrected within 24 hours following receipt of verbal notification from the ministerial Representative.
- .2 Subbase
- .1 The thickness of the subbase is shown on the drawings and is made of MG-112 aggregate. Aggregates are spread in layers of uniform thickness not to exceed 300 mm. The Contractor shall use a spreading method to prevent any segregation of aggregates.
 - .2 The minimum water content of the material before compaction is 5.0% if the percentage passing the 5 mm screen is less than 50%, and otherwise 7.0%.
 - .3 Compacting is then done using the method described under "Compacting of materials." Water content shall be adjusted based on the results of tests as prescribed in BNQ 2501-170. The required degree of compaction is 95% of maximum dry density as determined by BNQ 2501-255 or 98% of maximum dry density as determined with a testing bench according to method LC 22-001.
 - .4 Before laying the subbase, the top of the subgrade shall be free of ruts or other depressions and shall not deviate by more than 20 mm from the levels and longitudinal sections and transverse sections shown on the drawings.
- .3 Base
- .1 The thickness of the base is indicated on the drawings and it is made of type MG-20 crushed stone. The material is spread in a single layer. The Contractor shall ensure that no segregation of aggregate occurs during placement of the material.
 - .2 The minimum water content of the material before compaction shall be as close as possible to the optimum water content obtained with test method BNQ 2501-255.

- .3 Compact as described under the heading “Compacting of materials.” The minimum compaction required is 98% of the maximum dry density obtained with test method BNQ 2501-255 or 100% of the maximum dry density determined with a testing bench according to method LC 22-001.
- .4 Before asphalt is placed, the subbase surface shall be free of ruts or depressions. Any deviation exceeding 10 mm from the required level shall be corrected.
- .5 When the Contractor directs traffic onto the aggregate-surface road before placing the asphalt, the base materials shall be decontaminated. The laboratory hired by the Park will determine which areas are to be decontaminated. This work and any additional materials required will be at the Contractor's expense.

3.5 BITUMINOUS CONCRETE PAVEMENT

- .1 Preparation of aggregate surface
 - .1 The work to prepare the aggregate surface consists in correcting the longitudinal and transverse lines and shaping the road to the required camber and bank.
 - .2 Where required, the Contractor shall scarify the surface materials to allow shaping.
 - .3 Materials disturbed or added for final shaping shall be compacted according to the requirements for installing roadbed materials.
 - .4 When traffic is allowed on the aggregate base, the Contractor shall place the asphalt base course within 5 days after receiving the grain size analysis results for the roadbed materials. This time limit may be extended if the weather is not suitable for placing asphalt.
- .2 Conditions for placing asphalt
 - .1 The surface on which the hot mix is to be placed shall be dry, clean and not frozen.

- .2 The tack coat shall be allowed to cure sufficiently before a new course of hot mix is laid.
- .3 The ambient temperature shall be above 10°C and rising when a course of hot mix is placed to a thickness of less than 50 mm after compaction. For other thicknesses, the ambient temperature shall be above 2°C and rising. Temperature readings shall be taken 1.5 m above the ground and over 5 m away from work site equipment or other source of heat.
- .3 Transportation of mix
 - .1 It is never permitted to overheat a mix to counteract cooling caused by travel time, no matter how long the trip. The decrease in hot mix temperature from mixing to placement shall not exceed 15°C. And trucks shall meet the requirements of article 13.3.3.4 of the CCDG.
- .4 Seams
 - .1 Longitudinal seams shall be parallel to the alignment lines and shall not be superimposed.
 - .2 Longitudinal seams in the surface course shall not be in the wheel tracks.
 - .3 Longitudinal seams in the surface course shall be offset at least 100 mm from lane delineator markings.
 - .4 Longitudinal seams in successive courses of hot mix shall not be superimposed.
 - .5 Only one longitudinal seam is allowed, and if possible, the placement of each course of hot mix shall be executed in a single operation.
 - .6 At the end of each paving day, the distance between asphalt strips shall be no more than 10 m.
 - .7 The edges of asphalt strips that are to be covered with another course shall be bevelled to a slope of 1V:3H.

- .8 The Contractor shall apply a layer of tack coat at the rate of 0.4 L/m² over the full width of the surface bevelled to 1V:3H.
- .5 Special holdback for non-conforming transverse seams and defects in surface characteristics of asphalt courses
- .1 An amount of \$2,500 shall be held back for each transverse seam and each surface defect not conforming to article 13.3.4.7 of the CCDG – *Caractéristiques de surface des couches du revêtement* until the Contractor corrects the non-conformity and renders it acceptable.
- .2 The attached sketch describes the method for determining conformity using a 3-metre rule.
- .3 The correction method shall be approved by the supervisor. When the correction method involves heating the asphalt in place, the Contractor shall take particular care to avoid undue hardening of the bitumen which could affect the low service temperature of the bitumen.
- .4 A special holdback shall become permanent if, at the time of final acceptance, satisfactory corrective action has not been taken.
- .6 Placement of asphalt
- .1 The asphalt pavement to be placed consists of two courses:
- .1 One base course 80 mm thick of type GB-20 (route 132) or type ESG-14 to a thickness of 60 mm for secondary roads
- .2 One surface course 40 mm thick of type ESG-10.
- .3 **Bridge deck:**
- .1 Two (2) 40 mm courses, for a total thickness of 80 mm of type ESG-10 bituminous concrete (bitumen PG64-34) to at least 92% (LC 26-040/045) to be placed during summer 2016, permanent pavement.
- .2 One course 65 mm thick of type ESG-10 bituminous concrete (bitumen PG58-28) to at least 92% (LC 26-

040/045) to be placed during autumn 2015, temporary pavement.

- .2 The rate of placement shall be controlled by the Contractor so as to install courses of the required thickness.
- .3 A deviation of $\pm 5\%$ calculated daily will be accepted by the ministerial Representative. Any daily quantity greater or less than this tolerance will result in a permanent holdback equal to the total value of that quantity of hot mix based on the price indicated on the ticket, including incidental expenses. The ministerial Representative takes into consideration the corrections to be made where placement on the shoulders is given a triangular profile.
- .4 The equipment used to place hot mix (paver, road roller, trucks, etc.) shall meet the requirements of article 13.3.3 of the CCDG. Manual tools shall be cleaned outside the surface to be paved and the surface of newly placed asphalt. The paver shall have a functional infrared seam heater.
- .5 The forward speed of the paver shall allow placement of asphalt with the density and characteristics prescribed in the drawings and specifications.
- .6 The paver shall have an electronic system for longitudinal and transverse control. The control system shall be able to make corrections in longitudinal shaping based on average readings and maintain the transverse slopes required. This system shall be functional for the correction, base and surface courses.
- .7 A feeder vehicle shall be used for the placement of hot mix in the base, intermediate and surface courses. Only the placement of the correction course does not require the use of a feeder vehicle.
- .8 The feeder vehicle is a unit specifically designed to transfer hot mix from trucks to the paver without putting hot mix on the road. The feeder vehicle shall be self-propelled and independent of the paver. The minimum hot mix capacity of the feeder vehicle shall be 22 tonnes.

- .9 Each paver shall be supplied by a feeder vehicle. A feeder vehicle cannot supply more than two pavers at a time and can only carry one type of hot mix with a unique formula. Each paver fed by a feeder vehicle shall have an additional loading hopper with a minimum capacity of 12 tonnes of hot mix. Feeder vehicles shall be able to mix the hot mix internally or in the additional loading hopper so as to deliver a uniform mix to the paver. Feeder vehicles shall not be used to transport product from the mixing plant to the paver. The forward speed of the pavers and the feeder vehicle shall be coordinated based on the rate of production and supply of hot mix so as to avoid stopping the pavers. The pavers and the feeder vehicle also shall be positioned so as to avoid contact between them and avoid stopping the pavers. Stopping a paver will be tolerated only in the event of a feeder vehicle breakdown. Breakdown is defined as mechanical, electrical or electronic failure preventing the feeder vehicle from operating properly. In such a case, only the hot mix already produced as of the time of breakdown shall be placed without the use of a feeder vehicle.
- .10 A feeder vehicle shall not used to place hot mix on a structure. The requirements set out in the *Clause relative à la circulation d'équipements de chantier pour le revêtement de chaussée en enrobé sur les structures* shall be complied with.
- .11 Any perceptible irregularity on the asphalt surface shall be corrected before starting compaction.
- .12 Rolling shall be completed before sunset unless otherwise indicated by the ministerial Representative.
- .13 Checking asphalt compaction on receipt (moisture density gauge)
- .1 The first paragraph of the article "*Contrôle de réception de la compacité du revêtement, vérification de la compacité*" (13.3.2.2.5 a)) of the CCDG is cancelled and replaced with:
- .2 The ministerial Representative and the Contractor jointly check the compaction of asphalt pavement using a moisture density gauge on the backscatter setting.

- .3 The moisture density gauge shall be supplied by the Contractor, and compaction shall be checked at the end of each day of asphalt placement.
- .4 Calculation of penalties in the event of non-conformity of compaction

A Calculating revised unit price of a lot

If the average compaction value of a lot does not meet the minimum requirement set out in article *Contrôle de réception de la compacité du revêtement* (13.3.2.2.5) of the CCDG, the unit price of the lot shall be adjusted using the following formula:

$$PRe: PU (1-Fc)$$

PRe: revised price of hot mix

PU: the unit price includes the base price of the mix, the cost of the bitumen and the cost of the work (placement of hot mix, shipment of bitumen and shipment of hot mix).

Fc: correction factor for the compaction characteristic

Fc: 0.125 (93-D)

D: average compaction of lot

93: minimum compaction required

B Calculating permanent holdbacks

The holdback for asphalt pavement which fails to meet compaction requirements is calculated by multiplying (PU-PRe) by the quantities involved.

- .5 The surface of each layer (surface course, tack, base) shall have a uniform texture, free of segregation, and be regular and conform to prescribed alignments and slopes. Transverse and longitudinal shaping of the paved surface shall allow runoff to the ditches with no standing water remaining on the surface. After final rolling of each course, the ministerial Representative verifies alignments and slopes. All irregularities or depressions greater than 5 mm per 3 m on surface courses or 6 mm per 3 m on other courses shall be corrected.

- .6 Any defective section shall be replaced or remedied. These corrective actions shall be approved by the ministerial Representative before the actions are executed, and they do not relieve the Contractor of its obligations with respect to the end result. Complete replacement of asphalt is also defined as corrective action. When the requirements for thickness or percentage compaction of paving courses are not met, the Contractor can hire an independent laboratory, at its expense, to re-evaluate the pavement by core sampling. Samples shall be taken at locations determined jointly by the Contractor and the ministerial Representative.
- .7 Typical Clause relative to the circulation of the paving equipments on structure(bridge).
- .1 The feeder vehicle must not be used for the works of paving on a structure.
- .2 Contrary to the indications of the article "Utilisation des ouvrage d'art" (6.11) of the CCDG, the total mass in charge of a finisher does not have to exceed 28 tons on a structure without display in weight limit. When the use of more than one finisher is necessary on a structure, a minimal free distance of 20 m must be any time maintained between each of these. A finisher must be accompanied only with a single truck.
- .3 During the realization of the works by scrapping or by the posing of coated, trucks loaded in wait have at no moment to take place on the structures situated inside or outside of the limits of the construction site. The waiting lines must be situated outside the limits of the structures.
- .4 Only in the construction limits, a feeder vehicle is authorized to circulate on a structure without display of limitation if all the following conditions are respected:
- .1 The feeder vehicle must be empty.
- .2 The feeder vehicle must be the only one on the structure and has to be at all time at the closest of the central axis.

- .3 The feeder vehicle as to circulate in a maximal speed of 10 kph and does not have to brake abruptly.
- .5 For every structure and following the verbal notice of the entrepreneur to the supervisor confirming that the feeder vehicle was emptied of its contents, the supervisor hands to the entrepreneur a written notice authorizing it to circulate on the structure. Any defect of the entrepreneur to obtain this notice before the passage of the feeder on a structure entails a permanent restraint of 10 000 \$ as for damages.
- .6 The entrepreneur has to supply to the supervisor the data sheets of all the equipment of more than 23 tons, excluding trucks, that must circulate on the structures, and at least 3 days before the beginning of the works of correction by scrapping or pose (installation) of coating.
- .8 Paving on structures
 - .1 The works consist in covering the deck of the bridge and its approaches with asphalt
 - .2 The entrepreneur has to use asphalt blending recipes of which were already validated for the Ministry during previous contracts.
 - .3 The requirements of the essay of resistance in the rutting apply.
 - .4 When it is not possible to put the membrane of waterproofness inside authorized period, the entrepreneur has to put a temporary pavement.
 - .5 After May 15th, the entrepreneur has to remove the temporary pavement according to the requirements stipulated to articles "Préparation de la surface granulaire" (13.1.3.1.2) and "Décapage (15.11.3.1.1)" of the CCDG before proceeding to the implementation of the membrane of waterproofness and the coated.

.9 Quality control

- .1 In accordance with CCDG, the Parks Canada Representative reserves the right to take samples at the plant or the work site (in the paver box) at any time for the purpose of product quality control.
- .2 The Contractor shall re-validate the product formulas at the start of each season. The Contractor shall advise the Engineer at least 24 hours in advance for formula validations.

.10 Tack coat

- .1 The tack coat is applied uniformly using a spray bar under pressure:
 - .1 At the residual rate of 0.30 L/m² on planed surfaces;
 - .2 At the residual rate of 0.20 L/m² for newly paved surfaces and on bridge deck. No tack coat is required for temporary pavement.
 - .3 At the residual rate of 0.40 L/m² on the vertical surface of longitudinal and transverse seams.
- .2 The Contractor shall take all necessary precautions to ensure that a tack coat does not spill onto already paved adjacent surfaces or surfaces that are not going to be covered with asphalt.
- .3 While the tack coat is curing, vehicle traffic shall be detoured.
- .4 It is forbidden to apply tack coat during rain or on wet or frozen surfaces or when the ambient air temperature is below 10°C.
- .5 A surface to which a tack coat has been applied shall be covered with the new asphalt course the same day if the road is open to traffic.
- .6 Cutback shall not be used on tack coats.
- .7 The tolerance for the rate of application is 10% and the Contractor shall submit to the Parks Canada Representative its method for application and control.

- .8 Additional requirements
 - .1 Traffic shall not be allowed on newly laid pavement until the pavement temperature is below 50°C.
- .11 Checking hot mix compaction at longitudinal seams on receipt
 - .1 General
 - .1 The Contractor shall take particular care when making longitudinal seams so that the compaction of the longitudinal seams between asphalt strips meets the requirements of this article.
 - .2 Parks Canada and the Contractor shall check the compaction of longitudinal seams jointly using a moisture density gauge on the backscatter setting. The moisture density gauge shall be supplied by the Contractor and seams shall be checked for compaction on receipt at the end of each paving day.
 - .3 The calibration, correction factor and determination of compaction shall be carried out as described in the article *Control de réception de la compacité du revêtement, vérification de la compacité* (13.3.2.2.5 a) of the CCDG.
 - .2 Seams to be checked on receipt
 - .1 The compaction checks on receipt described in this article apply to all longitudinal seams located between two traffic lanes and to all asphalt courses installed under this contract, except correction courses.
 - .3 Location and frequency of measurement
 - .1 The compaction of all seams made during the day shall be measured. The measurement site shall be chosen at random in the first 250 metres of seam made during the paving day, and the subsequent measurement sites are located at 250-metre intervals from the first site, following the order in which the seams were made.

.2 At each measurement site selected as indicated in the previous paragraph, the density of the asphalt shall be measured using a moisture density gauge in two different places located on either side of the seam, with the emitting source (or the handle) located less than 150 mm from the seam. A measurement shall be the average of 3 readings (lasting 30 seconds on the backscatter setting) without moving the instrument. The moisture density gauge shall be aligned with the longitudinal axis of the road and the instrument shall be kept stable and in full contact with the surface of the pavement. If the moisture density gauge is not stable, it shall be moved longitudinally until it is stable on the surface of the pavement.

.4 Acceptance of seam compaction

.1 Individual readings

.1 For each measurement site, if the density of the asphalt measured with the moisture density gauge is under 89%, a permanent holdback of \$100 will be applied to the contract, irrespective of the average result of all the measurements taken on that paving day.

.2 Average of readings taken during the paving day

.1 If the average of all the compaction measurements taken on any given day is under 90%, the supervisor will advise the Contractor in writing that the compaction will be re-evaluated by core sampling. The supervisor will note the exact location of the measurement sites selected for the day so that core samples can be taken at the same locations.

.3 Re-evaluation of compaction by core sampling

.1 The supervisor will set a date for the re-evaluation of seam compaction by taking core samples at the measurement sites selected on the paving day. The core samples shall be taken within 20 days after the notice is sent to the Contractor.

- .2 The percentage compaction of the pavement is the ratio of raw density of the core sample taken on the road to the average maximum density for the day as determined by checking on receipt, multiplied by 100.
 - .3 The tests to determine the raw density of the core samples will be done by a laboratory approved by Parks Canada and the Contractor in accordance with MTQ test method LC 26-040.
 - .4 The Contractor can send an observer to witness the core sampling and the tests; any comments concerning a procedure that it considers incorrect shall be made immediately when the problem arises, and any dispute shall be brought to the attention of the supervisor.
 - .5 If the average of compaction measurements by core sampling is under the minimum compaction requirement of 90%, the seams made on that day will be deemed non-conforming and a permanent holdback of \$2.50 per metre of seam made on that day will be applied to the contract.
 - .6 The costs associated with this re-evaluation shall be paid by the Contractor.
- .12 Evaluation of bond between an asphalt course and the course immediately under it
- .1 If the Contractor fails to comply with any of the requirements set out in articles *Liant d'imprégnation ou d'accrochage, Matériaux, Mise en œuvre* and *Mise en œuvre* (13.2, 13.2.1, 13.2.4 and 13.3.4) of the CCDG, the work shall be deemed defective and a special holdback can be applied.
 - .2 The supervisor can, after analyzing and deeming acceptable the Contractor's explanation, authorize an evaluation with an apparatus to measure course bonding. The costs associated with this evaluation, including signage costs where applicable, shall be paid by the Contractor, irrespective of the result. For the results of

the evaluation to be accepted, the following conditions shall be met:

- .1 Evaluation performed by a laboratory accepted by both parties.
- .2 Evaluation completed and results delivered within 30 days after the evaluation is authorized.
- .3 Tests carried out at the work site in accordance with method LC 25-010. The supervisor can, for exceptional reasons, agree to have core samples with a diameter of 150 mm taken to allow tensile tests to be done in a laboratory as also provided in method LC 25-010.
- .4 The choice of grasping system, segmentation of the zone identified as potentially defective, and the number of tests per segment are determined before the start of the evaluation by the supervisor in accordance with the following directives:
 - .1 Choice of grasping system
 - .1 The grasping system without glue is used where the interface to be loaded is more than 35 mm from the surface.
 - .2 The grasping system with epoxy glue is used where the interface to be loaded is 35 mm or less from surface.
 - .2 Segmentation of zone identified as potentially defective
 - .1 A segment is limited to 400 metres maximum and shall be consistent in terms of defect or defects. If the zone identified as potentially defective is between 400 and 800 metres long, it shall be divided into two parts of equal length to create two segments. If the zone identified as potentially defective is between 800 and 1200 metres long, it shall be divided into three parts of equal length

to create three segments, and so on for zones over 1200 metres long.

.3 Number of tests per segment

- .1 The tests are done at three different chainings located at 25%, 50% and 75% of the length of the segment. Two tests per chaining will be done, one test in one of the wheel tracks and the other outside the wheel tracks. The transverse location of the two tests in each chaining shall be determined by the supervisor, who will chose the locations with the most unfavourable conditions for bonding, taking into consideration the geometry of the road, the work sequence and the information in the work site memo.
- .2 Where applicable, tests considered not valid in accordance with section 9 of method LC 25 010 shall be repeated at a longitudinal distance of 0.5 metre from the initial or previous test.

.4 Criteria for acceptance and conformity of a segment

- .1 For a segment to be considered adequately bonded, the average of the three results in a wheel track and the average of the three results outside the wheel tracks shall be equal to or greater than 0.20 MPa at 20°C if the interface loaded is more than 35 mm from the surface, or equal to or greater than 0.30 MPa at 20°C if the interface loaded is 35 mm or less from the surface. Only one of the three results can be less than one or the other of these values. The verdict on a segment can therefore be determined after only three tests if the first two results in a wheel track or outside the wheel tracks are individually less than one or the other of the values specified above.

- .2 If a segment does not meet the above criteria, the work on the whole segment shall be deemed defective and the Contractor shall re-do it or accept a special holdback to offset the defects observed.

3.6 REFILLING AND SHAPING SHOULDERS

- .1 After paving, the Contractor shall spread aggregate to refill and shape the shoulders to the same level as the surface asphalt course.
- .2 It is mandatory that the Contractor use an aggregate spreader to refill the shoulders after the base course and to shape the shoulders after the surface course.
- .3 Aggregate may be dumped at the edge of the pavement only when the temperature of the installed pavement is below 50°C.
- .4 The material shall be graded as indicated on the drawings. The material shall be compacted by a minimum of two passes with a road roller, and the Contractor shall take the precautions necessary to ensure the aggregate is not on the pavement at the time of compaction.
- .5 Material close to the guardrails shall be compacted with a vibrating plate.
- .6 After these tasks, the Contractor shall sweep the pavement with a mechanical sweeper.

3.7 CONNECTION TO THE EXISTING ROADWAY

- .1 The connection to the existing pavement shall be in accordance with DN-II-2-008 and as detailed on the drawings.
- .2 Planing of existing asphalt pavement shall be performed to a depth at least equal to the thickness of the surface course to be placed.
- .3 During planing operations, in places where the bond between the existing surface course and the next course under it is defective, planing depth shall be increased until the surface course is completely removed. Where planing depth is increased, the thickness of the surface course to be placed shall also be increased.

- .4 The planed surface shall be cleaned until it is free of dust, dirt and oil, leaving the surface in optimum condition for the application of tack coat.
- .5 The asphalt material resulting from planing is considered as waste and shall be disposed of away from the work site in accordance with Section 31 23 11 – Excavation and Backfilling.
- .6 Saw cuts shall be made to a depth equal to the thickness of the existing asphalt pavement to create an even vertical surface.

3.8 ROAD MARKINGS

- .1 General
 - .1 The Contractor shall perform the marking work in compliance with the plans and in accordance with the Representative of Parks Canada's instructions.
 - .2 The markings under this contract shall have the following colour and width:
 - .1 Side line (single unbroken line): 120 mm wide, white;
 - .2 Double unbroken centre line: 120 mm wide, yellow;
 - .3 Lane separator: 120 mm wide, white;
 - .4 Arrows: white, to MTQ *Tome V*;
 - .5 Cross-hatching: 120 mm wide, yellow;
 - .6 Stop line: white, to MTQ *Tome V*.
 - .3 In the case of double lines, the distance between the lines is 120 mm. Mark the lines making up the double unbroken centre line simultaneously.
 - .4 Where marking is performed after the road is reopened to traffic, the Contractor shall supply and install temporary marking using delineators glued to the asphalt surface. Install adhesive delineators in accordance with spacing requirements for premarking landmarks with film colour to match marking colours.

- .5 The marking subcontractor shall have all of the required equipment to perform the marking in accordance with the requirements of these specifications. Provide a list of marking work performed on behalf of MTQ in the past two years.

.2 Premarking

- .1 The Contractor shall premark the centre line and side lines using delineators.
- .2 The spacing of the markers shall be no more than 5 metres for straight lines and no more than 2.5 metres on curves.
- .3 The markers shall be placed so that they are completely masked by the proposed marking lines.

.3 Conditions for applying paint

- .1 Paint must not be applied to the pavement in the following conditions:
 - .1 Wet pavement;
 - .2 There is a risk of the paint being exposed to rain before a reasonable drying time has elapsed;
 - .3 The temperature of the pavement is below the dew point + 2°C.
 - .4 The air temperature is below 10°C.
 - .5 The pavement is covered with soil, debris or other dirt that can impede painting.

.4 Application of markings

- .1 Contractor responsibility includes testing and control of the paint and glass micro-bead application rate. In addition to the requirements of this section, the Contractor shall apply marking products in accordance with manufacturer's recommendations.
- .2 When applying markings, the Contractor shall measure the thickness of the product film and penetration of the glass micro-beads. Take a sample of each line segment on a transparent plate. Clearly identify the source of the samples on each plate. Submit plates to the Parks Canada Representative.

- .3 For lane separators, the alignment must be followed within ± 25 mm with relation to the marking plan and the marking width must be followed within ± 5 mm.
- .4 Contractor responsibility includes quality of marking until acceptance of the work. The Contractor must take all steps deemed necessary to protect the marking as it dries.
- .5 Where corrective work is required, the marking may not be masked with paint or any other method employed that may damage the asphalt surface. Residue from erased marking shall be recovered and disposed of at a site authorized by the MDDELCC.
- .5 Temporary road marking
 - .1 The Contractor shall use surface delineators systematically on new pavement until the permanent marking is completed.
 - .2 The temporary surface delineators described in *Marquage temporaire à l'aide de délinéateurs* (article 10.3.11.1.1 of the CCDG) must be installed immediately following placement of the asphalt course.
- .6 Removal of existing marking
 - .1 Upon approval by the Representative of Parks Canada, the Contractor must erase lines in locations where required for application of new markings to industry standards.
 - .2 Note that all traces of markings must be removed.
 - .3 If the Contractor will not apply markings to the road within 24 hours, delineators must be installed after removal of the lines.
 - .4 Planing and removal residues must be disposed of in compliance with existing environmental laws and regulations.

3.9 ROAD RESTRAINT SYSTEM

- .1 The Contractor shall install a platform for installation of guardrails in accordance with the instructions on the plans, on the figure 4.6-1 from tome VIII of MTQ standards and specifications for the end devices.

- .2 The Contractor shall install road restraints before reopening the road to traffic. Otherwise, the Contractor shall put in place temporary protection appropriate for the posted speed. Submit temporary protection measures to the Parks Canada Representative in the form of a plan signed and sealed by an engineer in good standing with the OIQ.
- .3 Installation of guardrail posts may be performed by driving where conditions are suitable. The Contractor shall use other installation methods when driving cannot be performed due to blockages in the subgrade material, frozen ground or soil that is too dense. In conditions that are not conducive to driving, excavation to install guardrail posts must be performed by augering, drilling or trenching. Fill excavation holes with MG 20 aggregate in 150 mm layers and compact in accordance with requirements for the roadbed materials.
- .4 Manage surplus excavated material in accordance with the requirements of Section 31 23 11 – Excavation and Backfilling.
- .5 Install posts plumb. Tops of posts shall be in an even line. Do not follow imperfections in the road or shoulders in the vertical and horizontal alignments.
- .6 Tolerances for guardrail installation are as follows:
 - .1 Height of ± 50 mm relative to the gravel platform profile measured at right angle to the face of the sliding element;
 - .2 Transverse deviation of ± 25 mm at top of post from the theoretical alignment as staked by the Contractor and approved by the Parks Canada Representative.
 - .3 Deviation of post axis of ± 15 mm from position of base of post indicated on the plans and specifications.
- .7 Bolts used to fasten sliding elements and fittings shall be tightened to a minimum torque of 100 Nm, without deformation of the components being assembled. After tightening, the threaded end of the bolts and anchor stems shall extend beyond the nut by at least 3 mm.
- .8 The Contractor shall provide for replacement of wire-strainers and expansion fittings for the work to relocate and repair existing flexible guardrail ends. The tension on the system shall be as indicated in standard

drawing VIII-3-GF006 unless otherwise indicated by the Parks Canada Representative.

3.10 SIGNALLING STRUCTURE FOR FORILLON NATIONAL PARK SIGNBOARDS

- .1 The Contractor shall provide and install concrete bases, post bases, accessories and posts in accordance with the plans and details. Signboards and board fasteners are supplied by the client and the Contractor shall ensure that the various components fit perfectly. In particular, the Contractor shall cut a 6-mm notch in the posts for each signboard fastener.
- .2 The Contractor shall prepare the various signboard locations, including excavation and backfilling.
- .3 Signboards and fasteners are available from the Forillon National Park operations centre.

3.11 EROSION CONTROL MATS

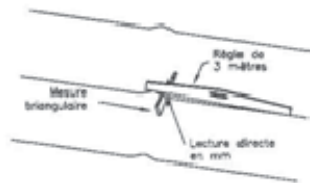
- .1 Immediately following topsoil spreading and final earthwork, install the biodegradable coconut fibre netting and sufficient wood stakes to hold the topsoil in place.
- .2 Space stakes every 500 mm around the perimeter of the strips and every 1,000 mm in the centre of the strips;
- .3 Anchor stakes no less than 150 mm into the topsoil and protruding from the ground by no more than 75 mm after compacting.
- .4 There must be a minimum overlap of 150 mm between strips;
- .5 Bury a length of biodegradable netting of no less than 300 mm at the top of the slope to a minimum depth of 200 mm.

END OF SECTION

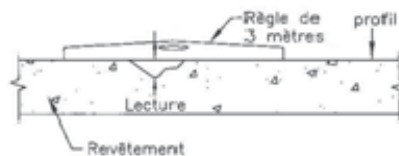
Appendix 1

MESURE À LA RÈGLE DE 3 MÈTRES

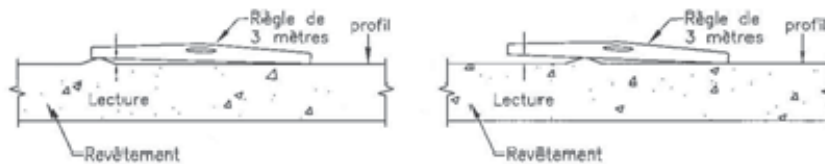
- Joint transversal ;
- Défectuosité ;
- Irrégularité ou dépression de la surface des couches de revêtement.



EXEMPLE: MESURE À LA RÈGLE



Joint creux, dépression ou irrégularité



Joint bombé ou irrégularité

NOTES GÉNÉRALES

- À l'aide d'une règle d'une longueur de trois mètres et d'une mesure triangulaire, prendre au moins deux lectures de façon à vérifier le respect des exigences de l'article "Caractéristique de surface des couches du revêtement" (13.3.4.7) du CCDG.
- La règle est déposée sur la surface et le plus grand écart est mesuré entre la surface du revêtement et la surface inférieure de la règle.
- Les écarts ne doivent pas seulement être mesurés entre des points où la règle est en contact avec la surface du revêtement.
- La règle peut être placée dans n'importe quel sens ou position pour obtenir l'écart maximal.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 00 00 – Generalities (Civil)
- .2 Section 31 11 00 – Clearing and Grubbing
- .3 Section 32 11 00 – Roadworks
- .4 Section 33 31 00 – Culverts

1.2 SCOPE OF WORK

- .1 Ensure supervision of the work and supply all manpower, equipment, tools, materials, transportation and other services required to carry out and complete the work described and specified in this section and contract documents, including but not limited to: the excavation and backfilling of specified areas and the application of stockpile topsoil and humus in preparation for re-vegetation on shown areas of drawings.

1.3 REFERENCES

- .1 Bureau de normalisation du Québec (B.N.Q.).
 - .1 NQ 0605-100/2001 : Landscaping using vegetation.
- .2 Ministère des Transports du Québec :
 - .1 Cahier des charges et devis généraux (CCDG) – Infrastructures routières – Construction et réparation (Statement of Work and General Specifications – Road infrastructures, Construction and Repairs).

1.4 PARKS CANADA'S REQUIREMENTS

- .1 If it is required to use topsoil or plants, other than those in place, these shall be obtained from a source outside Forillon National Park and must be approved by the Ministerial Representative.

1.5 ELEMENTS TO BE SUBMITTED

- .1 Advise the Ministerial Representative of the proposed source of topsoil or vegetation and provide access allowing said representative to conduct the analysis of materials, The acceptance of the topsoil will depend on the results of soil analyses and the inspection. Work shall not start until the

topsoil or plants have been approved by the Ministerial Representative. The Contractor shall obtain the approval of Ministerial Representative before any action.

- .2 The Contractor shall submit an attestation of conformity of the topsoil 20 days before its delivery when additional quantities are taken from the stockpile.
- .3 Topsoil tests and analyses shall be carried out by a laboratory with the Contractor assuming the costs of such. The laboratory shall be an agricultural analysis laboratory accredited by the *ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques* (MDDEFP).
- .4 Analyze the topsoil prior to stripping and stockpiling to determine its contents of clay, sand, mud, calcium, nitrogen, phosphorous, potassium (NPK), magnesium (Mg), soluble salts, growth inhibitors, and soil sterilizers as well as its pH.
- .5 Provide the Ministerial Representative with a copy of the soil analysis report as well as recommended soil improvements.

1.6 WORK SCHEDULE

- .1 Topsoil shall be spread and landscaping work carried out under the best possible conditions and without delay to ensure effective recovery of the vegetation.

1.7 TOPSOIL AND LANDSCAPING

- .1 Topsoil and landscaping consists of, without being limited to, supplying the materials and manpower required to carry out the manipulation and laying of soil and vegetation, according to good practices, including:
 - .1 Supply and application of stockpiled topsoil and humus to a minimum thickness of 100 mm where specified by the Ministerial Representative.
 - .2 Topsoil mixes including grading and specified amendments.
 - .3 Landscaping works.
 - .4 Landscape grading according to specified tolerances.
 - .5 The cleaning and off-site disposal of non-reusable materials at a location complying with the directives of the MDDEFP's Soil Protection and Contaminated Sites Rehabilitation Policy.

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PART 2 - PRODUCTS

2.1 SOIL

- .1 Loam: loose soil, neither too rich in clay nor too poor in sand, whose organic content varies between 4 % and 5 % for sandy loam and between 2 % and 3 % for clayey soil, the maximum admissible humus being 20 %. This soil's pH must be between 5.5 and 7.0. The soil must also be free of subsoil, roots, vegetation, debris, toxic matter and stones more than 50 mm in diameter.
- .2 Black soil (humus): consisting of decaying products, sufficiently supple and homogeneous, free of colloidal residue, wood, sulfur and iron, containing less than 60 % of organic materials by weight, and having a maximum water content of 15 %, The size of the shredded particles must be equal to or smaller than 6 mm.

2.2 MIX OF SCREENED TOPSOIL

- .1 Mix for areas to be sodded and seeded:
 - .1 Two parts loam.
 - .2 One part black soil.
 - .3 One part coarse sand.
 - .4 3 % to 7 % organic matter.

2.3 CHARACTERISTICS OF MIXES

- .1 The cation exchange capacity (C.E.C.) must be between 10 and 20.
- .2 The chemical verification of the soil shall be carried out using the "Walkey Black" oxidation method.
- .3 The acidity level (pH) must be 6.5.
- .4 Include the following chemical elements in the proportions shown:

| Chemical elements | Proportion |
|-------------------|------------|
| Phosphorous (P) | 100 ppm |
| Potassium (K) | 125 ppm |
| Magnesium (Mg) | 200 ppm |
| Calcium (Ca) | 2 000 ppm |

- .5 Fall within the following grading range:

| Screen | Passing % |
|---------|-----------|
| 10 mm | 100 |
| 5 mm | 98 to 100 |
| 1,25 mm | 90 to 97 |
| 630 µm | 65 to 90 |
| 315 µm | 25 to 65 |
| 160 µm | 15 to 25 |
| 80 µm | 5 to 15 |

- .6 Water retention capacity: maximum 20 %.

PART 3 - EXECUTION

3.1 PREPARATION OF EXISTING AREA

- .1 Level the ground, filling dips and creating a slope favoring the flow of water, Remove soil that has been contaminated by toxic materials, Remove debris as instructed by the Ministerial Representative.
- .2 Loosen to a depth of 100 mm the entire area of the foundation layer to be covered in topsoil, Repeat the operation wherever the transportation material and spreading of the soil have compacted said foundation layer.
- .3 Clear the surface of debris, roots, vegetation branches and stones more than 50 mm in diameter.

3.2 SPREADING OF THE TOPSOIL

- .1 Areas of revegetation.
 - .1 Have the Ministerial Representative inspect and approve the condition of the foundation layer before commencing the spread of the topsoil.
 - .2 Where revegetation work is to be carried out (as specified by the Ministerial Representative and the plans), spread the topsoil and humus on the approved and non-frozen foundation layer in even layers containing an adequate amount of water.

- .3 Spread the topsoil according to instructions, to a thickness of at least 100 mm on the areas or according to the Ministerial Representative's recommendations.
- .4 Manually spread topsoil around trees and plants where machinery is not allowed.
- .5 Unless otherwise indicated on the drawings, spread topsoil to a thickness of at least 300 mm for ornamental grass trenches, 500 mm for shrubs and 1 000 mm for trees.
- .6 Take into account 25 % settling of soil volume when placing the soil, to comply with projected levels.

3.3 LANDSCAPING

- .1 Level and move the soil so as to eliminate any irregularities and dips, ensuring the flow of surface water. Apply a layer of loosened loam, breaking it up and raking it.

3.4 RESTORATION OF STOCKPILING AREAS

- .1 Restore the condition of the stockpiling areas used for the work, to the satisfaction of the Ministerial Representative.

3.5 SURPLUS MATERIALS

- .1 Excavation surplus refused by the Ministerial Representative for the project's backfilling purposes (except for contaminated materials, demolition materials and special waste) can be disposed of at a site chosen by the Contractor, outside limits of Forillon National Park, with the applicable municipal authorisations. Once disposal has been completed, materials must be leveled to the satisfaction of the land's owner(s). The Contractor must obtain a letter of authorization from each owner of the land used for the disposal of materials. Provide to the Ministerial Representative a copy of the letters and the authorizations of the town of Gaspé prior to transport of the materials.
- .2 All of the aforementioned disposal work must be carried out in compliance with the MDDEFP's Directives and/or Regulations which, in the event of discrepancy with the above, will prevail over the preceding requirements.
- .3 All expenses relating to the use of a disposal and/or landfill site, including the cost of any permit and/or authorization, as well as loading, transportation and disposal costs are at the Contractor's expense.

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3.6 CLEANING

- .1 Clean in accordance with the section 01 74 11 - Cleaning.
- .2 Once completed, remove surplus materials, waste materials, tools and safety barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures

1.2 MEASUREMENT AND PAYMENT

- .1 Measure hydraulic seeding square meters of actual surface area for:
 - .1 Grass mixture including fertilizer.
 - .2 Legume mixture including fertilizer.
 - .3 Areas of blending into existing turf grass will not be measured for payment.
- .2 Measure maintenance during establishment period and warranty period of areas seeded in square meters.
- .3 Payment for seeding made at unit price bid of actual area surface measurements taken and computed by the Ministerial Representative.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 11 00 - Summary.
- .2 Scheduling:
 - .1 Schedule hydraulic seeding to coincide with preparation of soil surface.
 - .2 Schedule hydraulic seeding using grass mixtures and mixtures containing Crownvetch and/or Trefoil between dates recommended by Provincial Agricultural Department.

1.4 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

1.5 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.
- .3 Submit in writing 15 days prior to commencing work:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.
- .4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Landscape Contractor: to be a Member in Good Standing of Provincial Horticultural Trades Association.
 - .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
 - .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with the product Requirements and 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 in clean, dry, well-ventilated area.

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- .2 Replace defective or damaged materials with new.

1.8 WARRANTY

- .1 For seeding, 12 months warranty period is extended to 1 full growing season.
- .2 Contractor hereby warrants that seeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 1 full growing season.
- .3 End-of-warranty inspection will be conducted by the Ministerial Representative.

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 and 2 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
 - .1 Legume mixture: "Certified", "Specialty Seed", "Canada No. 1 and 2" for ditch seeding (slope stabilization) with application rate of 230kg/ha.
 - .1 Mixture composition Herbio Stable +:
 - .1 50 % Creeping Red Fescue.
 - .2 50 % Canada meadow grass Ruebens,
 - .2 Mulch: specially manufactured for use in hydraulic seeding equipment, [non-toxic, water activated, green colouring], free of germination and growth inhibiting factors with following properties:
 - .1 Type I mulch:
 - .1 Made from wood cellulose fibre.
 - .2 Organic matter content: 95% plus or minus 0.5%.
 - .3 Value of pH: 6.0.
 - .4 Potential water absorption: 900%.
 - .2 Type II mulch:
 - .1 Made from newsprint, raw cotton fibre and straw, processed to produce fibre lengths of 15 mm minimum and 25 mm maximum. Greater proportions of ingredients to be straw.

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- .3 Tackifier: water dilutable, liquid dispersion or water soluble vegetable carbohydrate powder.
- .4 Water: free of impurities that would inhibit germination and growth. The Contractor must supply water from a source located outside Forillon National Park limits.
- .5 Fertilizer:
 - .1 To Canada "Fertilizers Act" and Regulations.
 - .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.
- .6 Inoculants: inoculant containers to be tagged with expiry date.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the Ministerial Representative.
 - .2 Inform the Ministerial 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 Ministerial Representative.

3.2 INSTALLERS

- .1 Use installers members in Good Standing of Horticultural Trades Association.

3.3 PROTECTION OF EXISTING CONDITIONS

- .1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.
- .2 Immediately remove any material sprayed where not intended as directed by the Ministerial Representative.

3.4 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 Ministerial Representative's approval of grade and topsoil depth before starting to seed.

3.5 FERTILIZING PROGRAM

- .1 Fertilize when seeding and a second time during the establishment period until final acceptance.

3.6 PREPARATION OF SLURRY

- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Ministerial Representative. Supply equipment required for this work.
- .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
- .3 After materials are in seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.7 SLURRY APPLICATION

- .1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.
- .2 Hydraulic seeding equipment:
 - .1 Slurry tank.
 - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.
 - .3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.
 - .4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".
- .3 Slurry mixture applied per hectare.
 - .1 Seed: upon application rate specified in "Materials" section.

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- .2 Mulch: Type II, 3 000 kg.
- .3 Tackifier: 900 L or upon manufacturer's recommendations.
- .4 Water: Minimum [30,000] L or upon manufacturer's recommendations.
- .5 Fertilizer: 125 kg, ratio 1-3-1.
- .4 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
 - .1 Using correct nozzle for application.
 - .2 Using hoses for surfaces difficult to reach and to control application.
- .5 Blend application 300 mm into adjacent grass areas or sodded areas on previous applications to form uniform surfaces.
- .6 Re-apply where application is not uniform.
- .7 Remove slurry from items and areas not designated to be sprayed.

3.8 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.
- .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 Waste Management: separate waste materials for reuse, 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.
 - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by the Ministerial Representative.

3.9 PROTECTION

- .1 Protect seeded areas from trespass until plants are established.
- .2 Remove protection devices as directed by the Ministerial Representative.

3.10 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.
- .2 Perform following operations from time of seed application until acceptance by the Ministerial Representative.
- .3 Legume Mixture:
 - .1 Repair minor dead and bare spots as determined by the Ministerial Representative to allow establishment of seed prior to acceptance.
 - .2 Repair major dead and bare spots as determined by the Ministerial Representative in accordance with site climatic averages and recommendations of local horticultural governmental representative.

3.11 ACCEPTANCE

- .1 Seeded areas will be accepted by the Ministerial Representative provided that:
 - .1 Plants are uniformly established. Seeded areas are free of rutted, eroded, bare or dead spots.
 - .2 Areas have been mown at least [twice].
 - .3 Areas have been fertilized.
- .2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.12 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Repair and reseed dead or bare spots to satisfaction of the Ministerial Representative.
 - .2 Mow areas seeded upon the fertilization program established and as directed by the Ministerial Representative.
 - .3 Fertilize seeded 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.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 32 18 – Schedule Work Bar Chart (Gantt)
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 35 43 – Environmental Procedures
- .4 Section 31 23 11 – Excavation and Backfilling

1.2 SCOPE OF WORK

- .1 Provide all the manpower, equipment, tools, materials, transportation and other services required to carry out and complete all work described and specified in this section and Contract documents. The Work consists, but not limited to:
 - .1 Remove existing culverts;
 - .2 Provide and install new culverts;
 - .3 Provide and install concrete sloped end sections, cut-off walls and rip-rap at the new culverts ends.

1.3 REFERENCES

- .1 Bureau de normalisation du Québec (BNQ) :
 - .1 BNQ 1809-300 (2004) R2007 – M1 (2009): Construction Work – General technical clauses – Drinking water and sewer pipes;
 - .2 BNQ 2622-126: Reinforced Concrete and Unreinforced Concrete Pipes and Monolithic Lateral Connections for Evacuation of Domestic Wastewater and Storm Water;
 - .3 BNQ 2560-114 (2014): Aggregates.
- .2 Ministère des Transports du Québec (MTQ) :
 - .1 Tome III de la collection *Normes – Ouvrages Routiers* du MTQ : « Ouvrages d'art », chapitre 4 : « Ponceaux »
 - .1 Standard drawings :

- .1 III-4-002 – Installation des tuyaux de béton armé (TBA) et non armé (TBNA), assise en matériaux granulaires (réseau routier) - *Reinforced (RCP) and unreinforced (NCP) concrete pipe installation, granular bedding (road network)*;
- .2 III-4-010 – Aménagement des extrémités biseautées, ponceaux circulaires de 1200 mm et moins de diamètre – *Sloped ends circular culverts layout, 1200 mm diameter and less*;
- .3 III-4-011 – Pièce d'extrémité biseautée en béton – *Concrete sloped end section*
- .4 III-4-014 – Mur para fouille en béton et revêtement de protection – *Concrete Cut-off wall and protection surface*

1.4 SAMPLES

- .1 Present samples for testing purposes to the Ministerial Representative at the latter's request, and at the Contractor's expense.

1.5 SHOP DRAWINGS

- .1 Shop drawings are required but are not necessarily limited to the following :
 - .1 Culverts and accessories
 - .2 Concrete Sloped End Sections
 - .3 Cut-off walls
 - .4 Geotextile membranes
- .2 When the manufacturer for precast concrete elements detains a certification delivered by the BNQ in accordance with the protocol BNQ 2622-951, the Contractor can present the certification and its appendix. The elements that are not covered by the certification must be presented in accordance with the article "Shop drawings and product data" of Section 01 33 00 – Submittal procedures.
- .3 Work related to the shop drawings may only start after said drawings have been verified and approved by the Ministerial Representative.
- .4 The Contractor shall present an exhaustive list of the materials to be used, including the name of the manufacturer and supplier.

- .5 Within the limits of the Contract, all materials must be uniform, new and furnished from the same manufacturer.

1.6 CERTIFICATION OF MATERIALS

- .1 At least 2 weeks prior to the start of the work, present the results of tests conducted by the manufacturer and the certificate attesting that the pipes comply with the requirements of this section.
- .2 Ensure that pipes bear the certification stamp.

1.7 TRANSPORTATION, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in compliance with the manufacturer's instructions.
- .2 Renting, layout and restoration works for the stockpiling area are at the Contractor's expense.
- .3 The Contractor shall take the following precautions when handling pipes:
 - .1 The pipe shall be handled so as not to touch sharp objects;
 - .2 Avoid impact during handling;
 - .3 Storage surfaces shall be leveled, flat and clean;
 - .4 Pipes shall not be dropped or allowed to knock against another pipe;
 - .5 Gaskets shall be protected from excessive exposure to heat, direct sunlight, oil and grease.
- .4 All materials found to be damaged or in poor condition shall be rejected or replaced at the Contractor's expense.

1.8 WORK BY OTHER COMPANIES OR CONTRACTORS

- .1 If need be, the Contractor shall be required to coordinate his work with that of the Municipality or any other contractor or public utility, which may need to carry out work of any nature whatsoever, before or during the execution of work covered by this contract.

1.9 ALIGNMENT AND LEVELS

- .1 The Contractor shall strictly respect the layout and proposed pipe's shown in the plans, as well as the class and diameter of pipes, the number, positions and elevations.
- .2 The final location of an underground structure must not be more than 100 mm from that shown in the contract drawings. The final elevation of an underground structure must not be more than 25 mm from that indicated on these same drawings.
- .3 In the event that obstructions interfere with work to the point of requiring changes, the Ministerial Representative can require that work be modified or displaced accordingly.

1.10 WORKING METHOD

- .1 The Contractor must submit written working methodology for approval. The presentation of the work methodology must be done at least 2 weeks before the start of the work and meet the requirements of PCA, and MDDEFP MNR. Additionally, the Contractor work methodology must comply with the Section 01 35 43 - Environmental Procedure, as well as the following requirements:
 - .1 Isolate the work area in order to perform the works in a dry environment.
 - .2 Ditches must be restored to their original profiles or in conformity to the layouts indicated on to the plans (whichever is applicable);
 - .3 The Contractor shall minimize the width of the work area and equipment shall not be operated beyond the limits of the deforested areas indicated on the plans.
- .2 Should it be required, the Contractor shall engage in additional deforestation works, at his own expense, in order to install water deviation or retention works (cofferdams). The Contractor shall obtain authorisation from the Ministerial Representative prior to commencing additional deforestation works outside the limits indicated on the plans.

1.11 REMOVAL OF CULVERTS

- .1 Work related to the removal of existing culverts includes, without being limited to, the supply of materials, equipment and labour required for the removal according to the requirements of the present and the plans indications. Additionally, the work includes:
 - .1 Saw cuts on the pavement, if required;

- .2 The excavation, loading, transportation and disposal of excavation surplus and waste, complying with the requirements of the Section 31 23 11 –Excavation and backfilling;
- .3 Temporary retaining works, if required;
- .4 The dewatering of trenches and diversion of water in the culvert or in a designated location approved by the Ministerial Representative, according to the requirements of the Section 01 35 43 – Environmental procedures.
- .5 The complete removal of existing culverts including waste material disposal in a site authorized by the MDDEFP;
- .6 Backfilling works up to the level of the infrastructure if required.

1.12 INSTALLATION OF CULVERTS

- .1 Work related to culverts consists of, without being limited to, the supply of materials, equipment and manpower needed to carry out the installation of culverts complying with the requirements of: BNQ 1809-300 standard - Construction Work – General technical clauses – Drinking water and sewer pipes, the furnished plans and the requirements of this Section. Additionally, the work includes:
 - .1 The excavation, loading, transportation and disposal of excavation surplus and waste, complying with the requirements of the Section 31 23 11 –Excavation and Backfilling;
 - .2 Temporary retaining works if required;
 - .3 Pipes, cut-off walls and concrete sloped end sections;
 - .4 Water diversions, controls and dewatering of trenches in accordance with requirements of the Section 01 35 43 - Environmental Procedures.
 - .5 The supply, placement and compaction of the bedding, the lateral fill and the protection cover, with granular material in accordance with the standard drawing III-4-002 or the furnished plans.
 - .6 Accessories.
 - .7 The supply and placement of a non-shrink concrete plug upstream from the culvert when rock is exposed on the bottom of a trench or where indicated on the plans. The fill plug must have the following dimensions:

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- .1 Width equivalent of the trench width;
- .2 A height equivalent of the elevation between the bottom of the trench and the half height elevation of the culvert, where the plug is carry out;
- .3 One (1) meter in length.
- .8 Backfilling up to the infrastructure line or to the elevation of the finished soil/natural terrain;
- .9 Cut-off walls are not required when rock is exposed at the bottom of the trench.

1.13 RIP-RAP

- .1 Rip Rap shall be constructed with two different types of rock aggregate. The sub layer shall be constructed with crushed rock aggregate and the top layer shall be composed of round aggregate (river rock).
- .2 Rip rap shall be prepared from stones and rock recovered from 1st and 2nd class excavations. If the quantities available on site are insufficient or if the available stone does possess the required properties, the Contractor shall import the correct material on site.
- .3 The Contractor shall supply, manpower, equipment and transportation from site of origin to where it is required according to the plans at the work site,. The Contractor is responsible for the stone fragmentation if the plans or specifications require a different size than those available.
- .4 The stone used for rip-rap must be washed before final placing to eliminate any discharge of sediments. Wash areas can be constructed at the stockpiling site or on work site. In all cases, wash plants must include measures to meet the requirements of the Section 01 35 43 – Environmental Procedures.
- .5 Rip-rap works include, without being limited to, transportation, loading, all materials, installation, the manpower, tools and all equipment to carry out the work in accordance with the plans indications. Additionally, the work includes:
 1. 1st class excavations or 2nd class excavations and all preparation site works for rip-rap installation according to the plans or standard drawing indications;

2. The excavation, loading, transportation and disposal of excavation surplus and waste to a site complying with the requirements of the Section 31 23 11 –Excavation and Backfilling or at a site authorised by the MDDEFP.
3. The supply and placement of rip-rap and geotextile membrane as specified on plans;
4. Stone fragmentation if required.
- .4 The limits of rip-rap on the plans are approximate and should be adjusted according to the proposed slopes and natural slope of the land and according to the details indicated on the plans, or to the Ministerial Representative's indications.

PART 2 - PRODUCTS

2.1 PIPES

- .1 Reinforced concrete pipe (RCP)
 - .1 Reinforced concrete pipes: Class IV, unless otherwise indicated, complying with the requirements of the NQ 2622-126 for specified diameter, or as shown on plans.
 - .2 Joints shall have rubber gaskets complying with the requirements of the NQ 2622-126 or ASTM C443M standard.
 - .3 For each delivery, the Contractor shall provide the Ministerial Representative with an attestation of compliance. The attestation of compliance must contain the following information, for each production lot:
 - .1 The name of the pipes' manufacturer;
 - .2 The production date and place;
 - .3 The class, category and nominal dimensions;
 - .4 Results of analyses, tests and quality control measures required by the BNQ 2622-125 standard *"Tuyaux circulaires en béton armé et non armé – Guide de fabrication et de contrôle de la qualité en usine"* (Circular reinforced and non-reinforced concrete pipes — Guide to production and quality control in the plant);
 - .5 The production lot number.

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- .4 A production lot consists of pipes of the same class, category and dimension, which have been manufactured during a single ongoing production cycle under the same conditions.

2.2 ASPHALT MASTIC

- .1 In these exceptional cases when it is used in the production of sewer pipe joints, asphalt mastic shall comply with the ASTM's C-14 and C-76 standards. It shall be cold formed, lend itself to trowel application, be freeze and water resistant, be unaffected by waste water, and harden over time while retaining its elasticity.

2.3 BEDDING AND SURROUND MATERIALS

- .1 Bedding materials and cover materials shall comply with the standard drawings III-4-002 and the BNQ 2560-114 (2014) standard "Travaux de génie civil – Granulats".

2.4 BACKFILL MATERIALS

- .1 Backfill materials shall comply with Section 31 23 11 - Excavation and Backfilling.

2.5 GEOTEXTILE MEMBRANE

- .1 Geotextile membrane Type V that comply with the MTQ's standard 13101 - Géosynthétiques.

2.6 UNSHRINKABLE FILL

- .1 The unshrinkable fill shall comply with article "Unshrinkable Fill" of section 31 23 11 - Excavation and Backfilling.

2.7 CONCRETE SLOPED END SECTION

- .1 The concrete sloped end sections used at the culverts end must be reinforced and precast in accordance with the standard drawing III-4-011 specifications. When the proposed culverts exceed the diameters indicated on drawing III-4-011, the proposed concrete sloped end sections shall be modified and will conform to a maximum slope of 1.5H: 1V.
- .2 Shop drawings of concrete sloped end sections which are not covered or subject to a certificate of conformity issued by the BNQ shall bear the seal and signature of a member in good standing of the Ordres des Ingénieurs du Québec.

2.8 CUT-OFF WALL

- .1 Cut-off walls are required and must meet the requirements of the standard drawing III-4-010.

2.9 RIP-RAP

- .1 Rip-rap materials shall comply with the MTQ's standard 14501 - *Pierres d'enrochement et de revêtement de protection* (Rip-rap stone and protective covering); type and thickness as specified on plans.
- .2 Rip-rap rock aggregates must be washed before installation to eliminate fine sediments or particles.

PART 3 - EXECUTION

3.1 PREPARATION WORK

- .1 Clean and dry trenches prior to the pipe, cut-off wall and concrete sloped end section installation and remove all defective material from the site, to the Ministerial Representative's satisfaction.
- .2 Have pipes, cut-off walls and concrete sloped end sections approved by the Ministerial Representative prior to their installation.
- .3 The Contractor shall take all measures to control water inflow into the trench during construction and comply with the requirements of the Section 01 35 43 - Environmental Procedures.
- .4 Temporary means to control erosion and sediments
 - .1 Establish temporary means of controlling erosion and sediment to prevent soil loss and to prevent accumulation carried by runoff or sediment and dust particles carried by the wind, and, in accordance with the requirements of the section 01 35 43 – Environmental Procedures.
 - .2 Inspect control methods, maintain and repair until the restoration of the permanent vegetation is complete.
 - .3 Remove control methods, restore and stabilize areas disturbed during works.

3.2 DIGGING TRENCHES

- .1 Dig trenches in compliance with Section 31 23 11 - Excavation and Backfilling

- .2 Excavation of rock must be carried out in accordance with the Section 31 23 11 –Excavation and Backfilling.

3.3 CULVERT BEDDING

- .1 Have the layout and depth of the trench approved by the Ministerial Representative before placing the bedding material.
- .2 Bedding materials and cover materials installation must comply with the standard drawings III-4-002.
- .4 Bedding surface should be straight without hollow or high points.
- .5 Use bedding materials which are not frozen.

3.4 CULVERT AND CONCRETE SLOPED END SECTION INSTALLATION

- .1 The bottom of the trench dug to accommodate the culverts and the concrete sloped end sections must follow the required profiles. The soil at the bottom of this trench shall be uniform and undisturbed.
- .2 When the Ministerial Representative deems the soil at the bottom of the trench to be of poor quality, the Contractor shall remove this soil and replace it with the same material used for pipe bedding.
- .3 The Contractor shall lay the culvert and concrete sloped end section according to the plan indications, starting with the downstream extremity. Special attention must be given when installing cut-off walls in order to sufficiently compact the ground around the cut-off wall (minimum of 90% of the M.P.). Joints shall be perfectly sealed and secured. Backfilling shall be done on both sides at once.
- .4 Each extremity of the culvert shall be arranged and installed as per the standard drawing III-4-010 specifications, unless otherwise indicated on plan. This article shall also apply for culverts with a diameter larger than 1200mm.

3.5 GEOTEXTILE AND ROCK MEMBRANES

- .1 The installation and application of the protective covering shall conform with the requirements of articles 12.6.3 and 12.7.4 of the *CCDG- MTQ* and to those of this section of the specifications.

3.6 REPAIRS

- .1 All works deemed deficient and requiring repair or re-execution will be at the expense of the Contractor before the Ministerial Representative makes its recommendation of provisional acceptance.

END OF SECTION

Section B Normalized drawings (ND)

List of the normalized drawings (ND)

- DN-II-1-005: Élargissement de remblai
- DN-II-1-016: Transition transversale déblai-remblai et sol-sol
- DN-II-1-018: Transition longitudinale sol-sol
- DN-II-1-021: Tranchée transversal pour route existante
- DN-II-1-023: Transition aux approches de pont
- DN-II-1-024: Traitement des blocs à proximité de la ligne d'infrastructure pour route en déblai
- DN-II-1-025: Drainage de la structure de chaussée
- DN-II-2-001: Terminologie relative aux chaussées
- DN-II-2-002: Transition entre un pont (avec joint de tablier) et une chaussée en enrobé
- DN-II-2-003 : Transition entre un pont (avec joint dalle sur culée) et une chaussée en enrobé
- DN-II-2-006 : Chaussée en enrobé, accotement – route en dévers
- DN-II-2-008: Raccordement des revêtements en enrobe (épaisseur du nouveau revêtement supérieur à l'épaisseur du revêtement existant)
- DN-II-2-029: Isolation thermique - polystyrène
- DN-II-3-005: Drain en pierre
- DN-II-3-009: Aménagement à la sortie d'un drain
- DN-II-4-001: Bordure préfabriquée en béton
- DN-II-5-001: Musoir R500
- DN-III-4-002: Installation des tuyaux en béton armé (TBA) et non armé (TBNA), assise en matériaux granulaires (réseau routier)
- DN-III-4-004: Installation des tuyaux en tôle ondulée (TTO) circulaires – assise en matériaux granulaires (réseau routier)
- DN-III-4-010: Aménagement des extrémités biseautées, ponceaux circulaires de 1200mm et moins de diamètre
- DN-III-4-011: Pièce d'extrémité biseautée en béton
- DN-IV-8-005: Revêtement de protection pour fossés
- DN-IV-9-001: Ensemencement hydraulique protégé par un matelas de fibres en bois ou de paille (H-3)
- DN-VIII-3-GSR-001: Glissière semi-rigide avec profile d'acier à double ondulation sur poteaux de bois
- DN-VIII-3-GSR-010A: Glissière semi-rigide latérale avec profilé d'acier à double ondulation – transition de rigidité TL-3
- DN-VIII-3-GSR-024: Glissière semi-rigide avec profile d'acier à double ondulation – raccordement aux glissières de pont de Type 210
- DN-VIII-3-GSR-025: Glissière semi-rigide avec profile d'acier à double ondulation – raccordement aux glissières de pont de Type 210, plaque de raccord

Normalized drawings - Signalization

DN-V-1-001: Détails d'installation des panneaux

DN-V-1-002: Détails d'installation des panneaux de travaux

DN-V-2-001A: Installation des panneaux «arrêt» ou «stop», «entrée interdite» et «cédez le passage»

DN-V-5-023: Localisation des panneaux de signalisation à une intersection

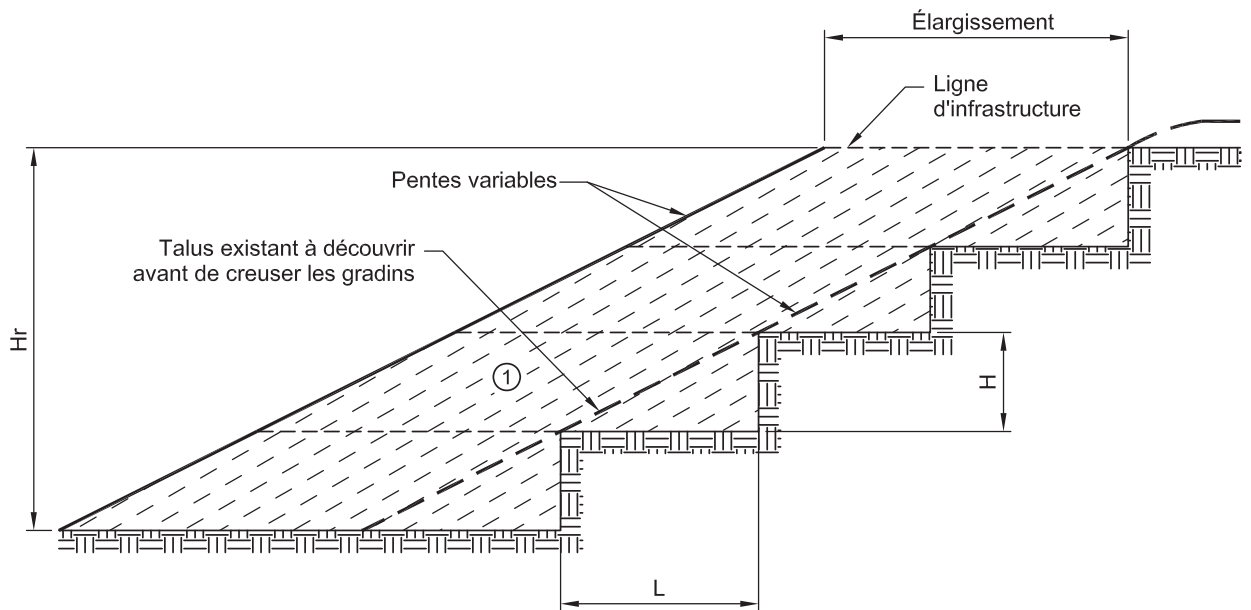
DN-V-5-048: Localisation des panneaux d'acheminement des services de carburant et de restauration à une intersection en T

DN-V-5-053 : Orientation d'un panneau de signalisation dans une courbe



NORME

ÉLARGISSEMENT DE REMBLAI



Hauteur et largeur des gradins

| Pente existante | Remblayage Hr < 4000 | Remblayage Hr ≥ 4000 |
|---------------------------|--------------------------|--------------------------|
| 1V : 3H à 1V : 2H | L : 1500 H : variable | L : 2500 H : variable |
| plus raide que 1V : 2H | L : variable H : 600 | L : variable H : 1200 |

L : largeur des gradins.
H : hauteur des gradins.
Hr : hauteur du remblai.

① Matériau identique au sol en place.

Notes :

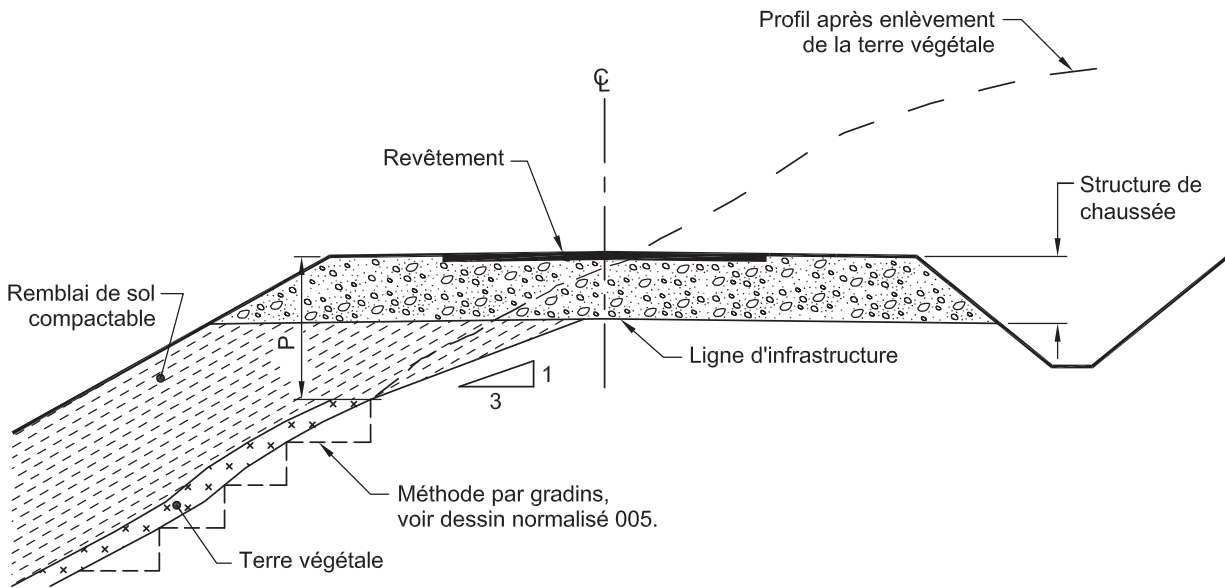
- la taille en gradins n'est pas requise si la pente existante est de 1V : 3H ou plus douce;
- la taille en gradins ne s'applique pas aux remblais de roc;
- les cotes sont en millimètres.

| |
|---------------------------|
| Tome II |
| Chapitre 1 |
| Numéro 016 |
| Date 2005 03 30 |

DESSIN NORMALISÉ

**TRANSITION TRANSVERSALE
DÉBLAI-REMBLAI ET SOL-SOL**

NORME



COUPE TRANSVERSALE

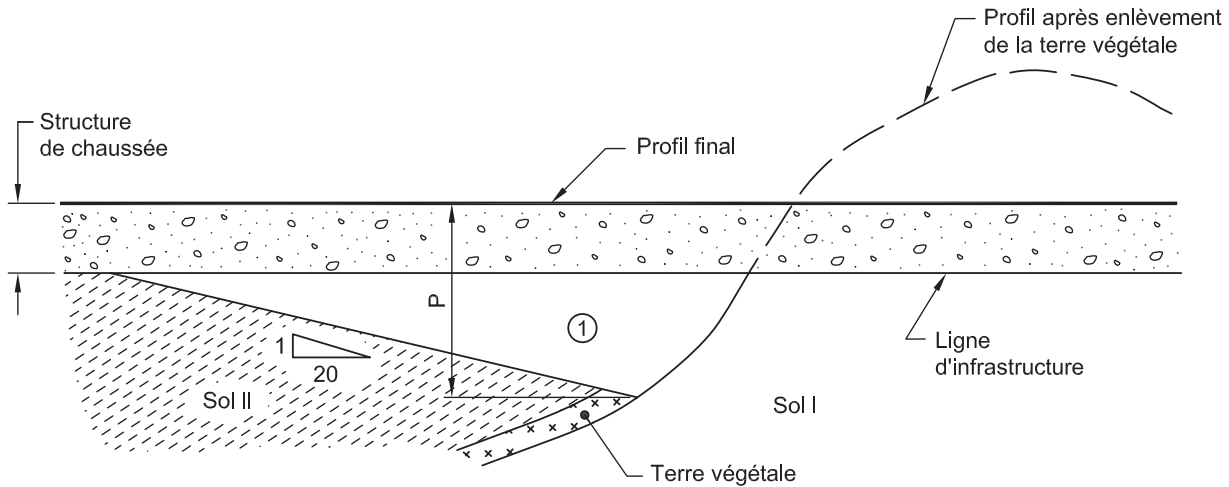
P : profondeur de la transition indiquée aux plans et devis.

Note :

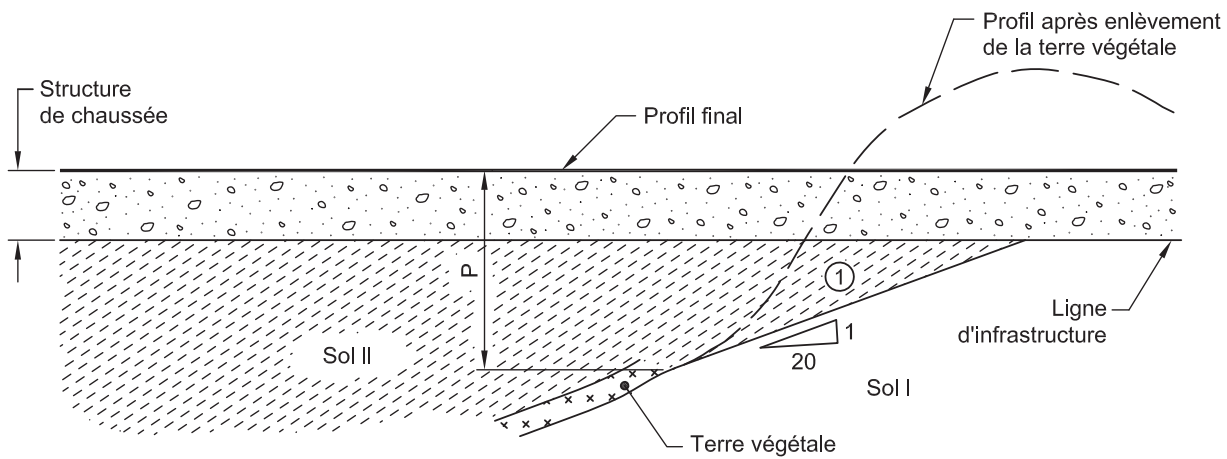
- lorsque la pente du terrain naturel est de 1V : 3H ou plus douce, les gradins et la transition ne sont pas requis.

TRANSITION LONGITUDINALE
SOL-SOL

NORME



GÉLIVITÉ SUPÉRIEURE DU SOL II



GÉLIVITÉ SUPÉRIEURE DU SOL I

P : profondeur de la transition indiquée aux plans et devis.

① La transition doit être réalisée du côté du sol le plus gélif et comblée avec le matériau adjacent le moins gélif.

Notes :

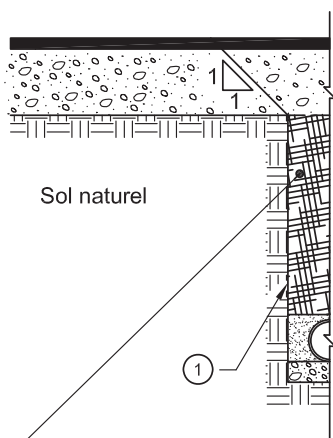
- la transition doit être effectuée sur toute la largeur de la plate-forme au niveau de la ligne d'infrastructure;
- la transition est inutile si les sols adjacents sont de gélivité semblable;
- les pentes indiquées doivent être considérées par rapport au profil final.



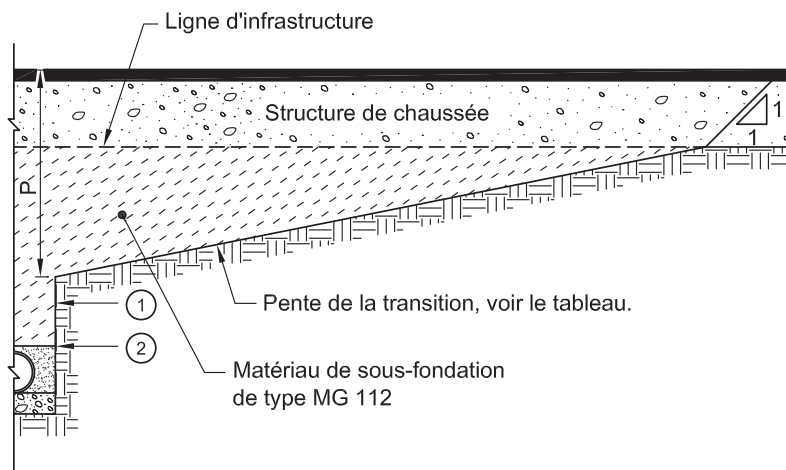
NORME

TRANCHÉE TRANSVERSALE
POUR ROUTE EXISTANTE

SANS TRANSITION



AVEC TRANSITION



① Sol naturel excavé (excluant les matériaux de structure de chaussée) si compactable; sinon, matériau compactable de gélivité semblable à celle du sol naturel

| Vitesse de base de la route (km/h) | Pente de la transition (V : H) |
|------------------------------------|--------------------------------|
| $V \leq 60$ | 1 : 5 |
| $60 < V \leq 80$ | 1 : 10 |
| $V > 80$ | 1 : 20 |

P : profondeur de la transition indiquée aux plans et devis.

- ① La pente de l'excavation est fonction de la méthode de travail et des exigences de la CSST en matière de stabilité.
- ② Lorsque le dessus du matériau d'enrobement ou le dessus du tuyau lui-même se trouve plus haut que la profondeur de la transition P, le cas avec transition s'applique, si le sol naturel est gélif.

MATÉRIAU — NORME APPLICABLE

Granulats (MG 112)

NQ 2560-114



NORME

TRANSITION AUX APPROCHES
DE PONTS

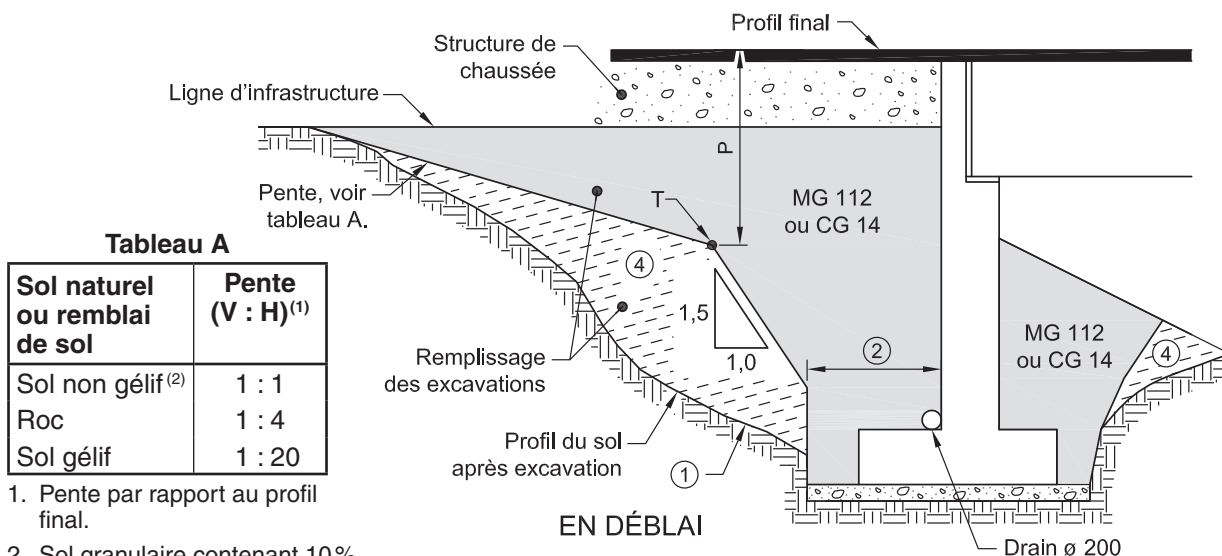


Tableau A

| Sol naturel ou remblai de sol | Pente (V : H) ⁽¹⁾ |
|-------------------------------|------------------------------|
| Sol non gélif ⁽²⁾ | 1 : 1 |
| Roc | 1 : 4 |
| Sol gélif | 1 : 20 |

1. Pente par rapport au profil final.
2. Sol granulaire contenant 10% ou moins de particules fines passant le tamis 80 µm.

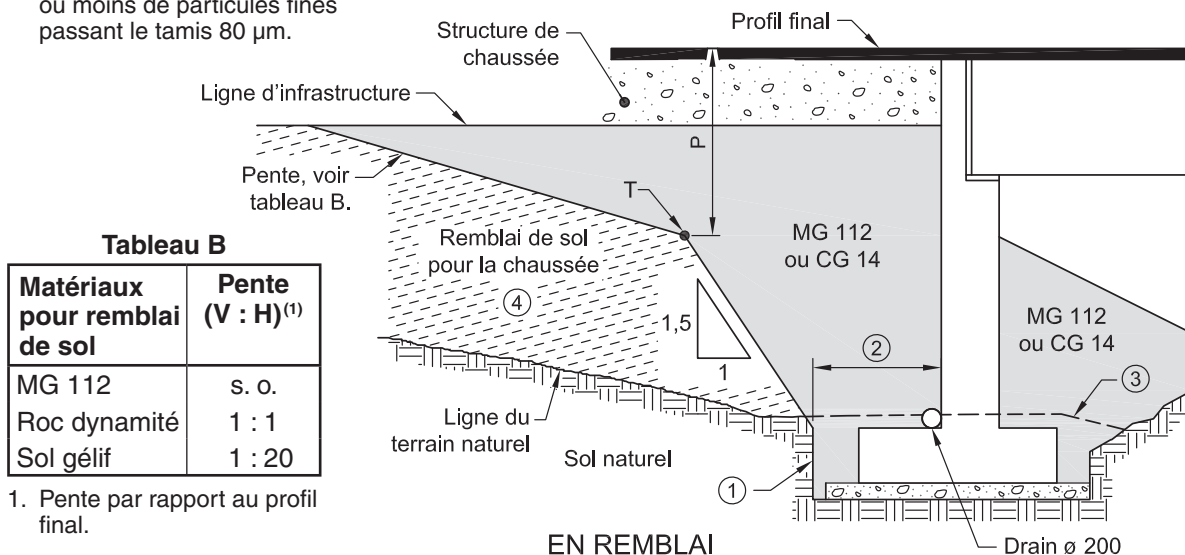


Tableau B

| Matériaux pour remblai de sol | Pente (V : H) ⁽¹⁾ |
|-------------------------------|------------------------------|
| MG 112 | s. o. |
| Roc dynamité | 1 : 1 |
| Sol gélif | 1 : 20 |

1. Pente par rapport au profil final.

P : profondeur de la transition indiquée aux plans et devis.

T : point de transition à la profondeur « P ».

- ① La pente de l'excavation est fonction de la méthode de travail et des exigences de la CSST en matière de stabilité.
- ② Le matériau granulaire de type MG 112 non concassé provenant d'une sablière ou CG 14 provenant d'une carrière est placé à partir d'une largeur déterminée par le remplissage des excavations ou par la largeur de la semelle lorsqu'il n'y a pas d'excavation.
- ③ Les volumes de matériaux situés au-dessus de la ligne de terrain naturel existant avant l'excavation pour la construction de l'ouvrage sont considérés comme des matériaux de remblai, tandis que ceux qui sont situés au-dessous de cette ligne de terrain naturel sont considérés comme du remplissage d'excavation.
- ④ Remplissage des excavations avec un sol compactable, du roc dynamité ou des matériaux granulaires.

Note :

- les cotes sont en millimètres.

MATÉRIAU — NORME APPLICABLE

| | |
|--|--------------|
| Granulats CG 14, MG 112 (après la mise en œuvre) | BNQ 2560-114 |
|--|--------------|

Tome
II

Chapitre
1

Numéro
024

Date
2008 10 30

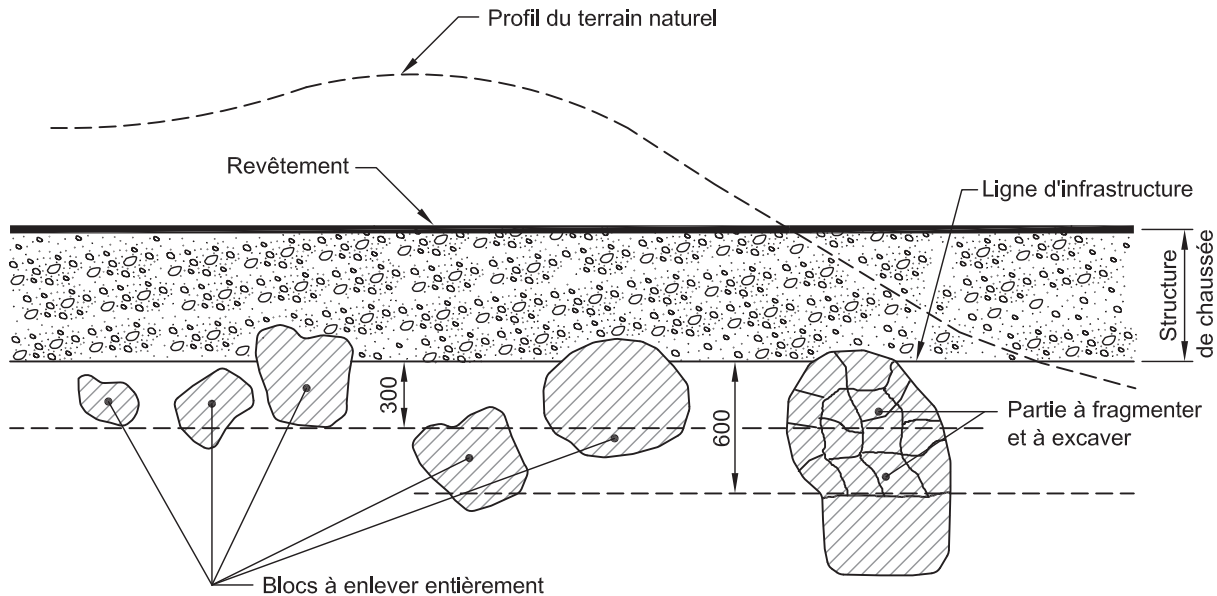
DESSIN NORMALISÉ

TRAITEMENT DES BLOCS À PROXIMITÉ DE LA LIGNE D'INFRASTRUCTURE POUR ROUTE EN DÉBLAI

Transports
Québec



NORME

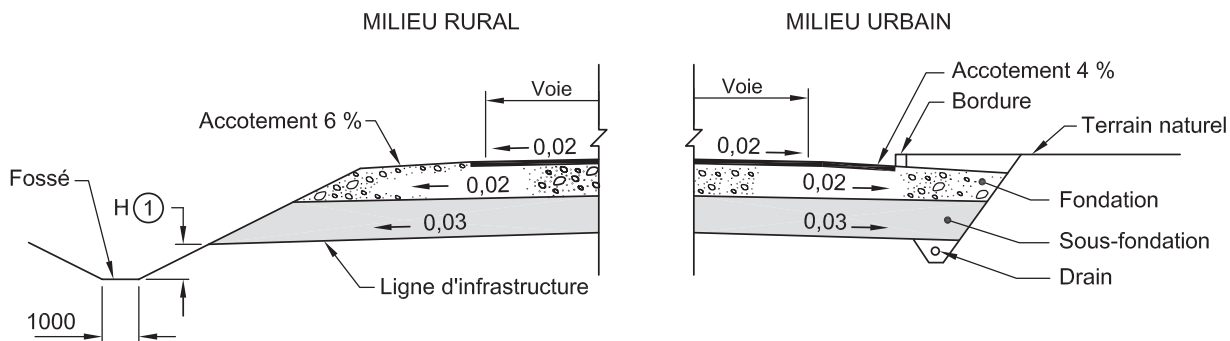


Notes :

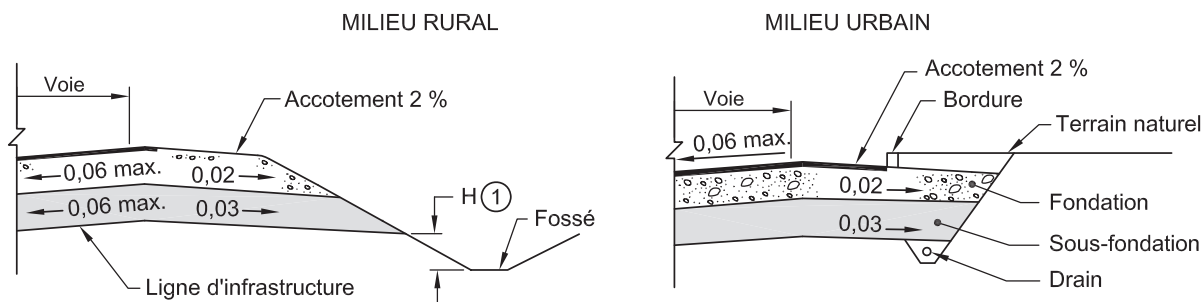
- tous les blocs de 200 à 300 mm de diamètre présents dans les 300 premiers millimètres sous la ligne d'infrastructure doivent être enlevés;
- tous les blocs de plus de 300 mm de diamètre présents dans les 600 premiers millimètres sous la ligne d'infrastructure doivent être soit enlevés, soit fragmentés et excavés jusqu'à cette profondeur;
- après l'enlèvement des blocs, l'excavation doit être comblée avec des matériaux similaires au sol naturel environnant exempt de blocs;
- les cotes sont en millimètres.

NORME

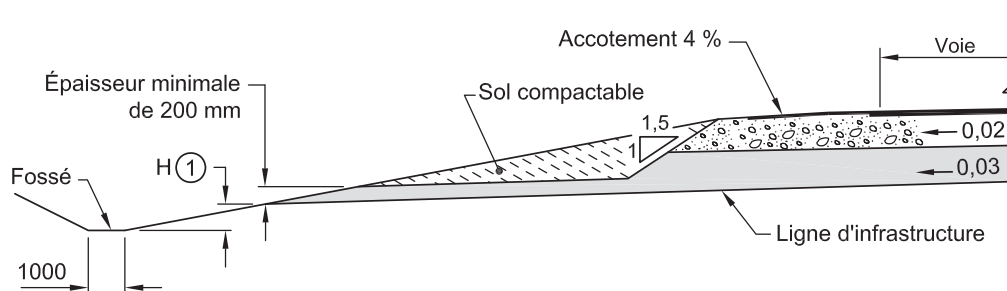
DRAINAGE DE LA STRUCTURE DE CHAUSSÉE



SECTION RECTILIGNE, BOMBEMENT NORMAL



SECTION EN DÉVERS



AUTOROUTE

① À l'exception du roc, la profondeur H des fossés mesurée par rapport à la ligne d'infrastructure doit être de 500 mm minimum pour les autoroutes et les routes nationales et de 300 mm minimum pour les autres routes.

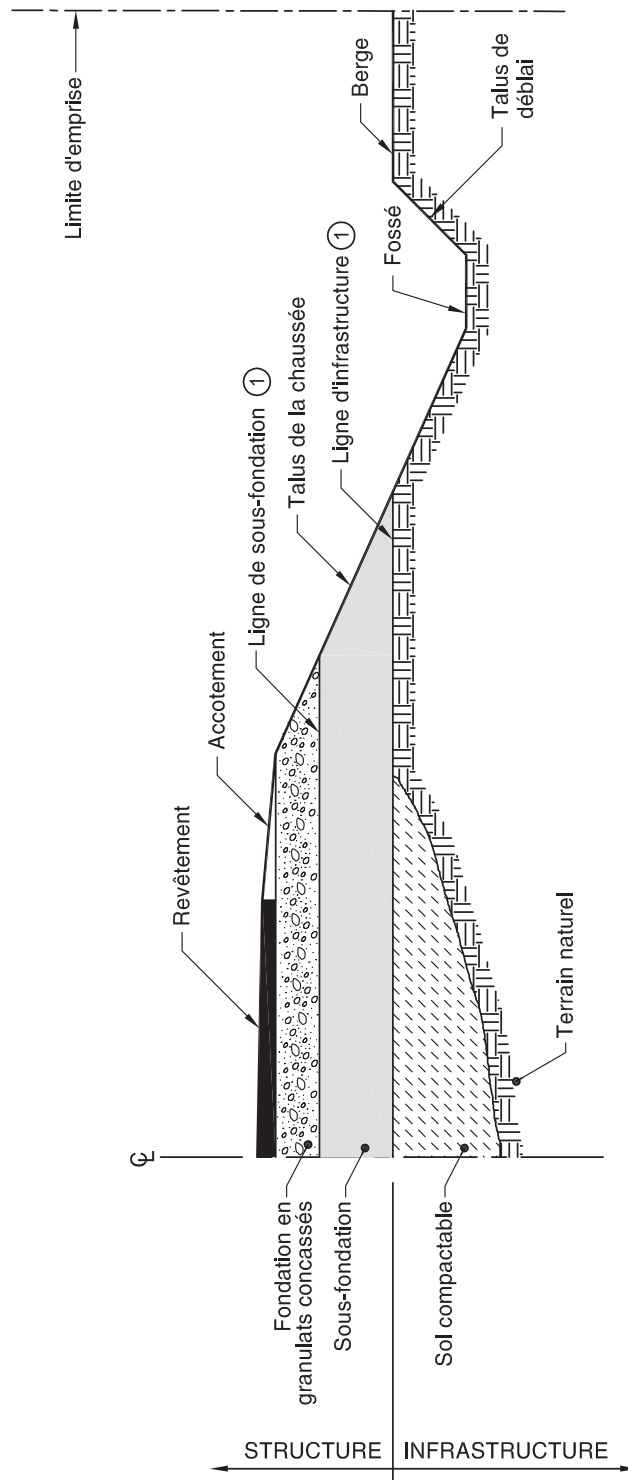
Note :

- les cotes sont en millimètres.

NORME

TERMINOLOGIE RELATIVE
AUX CHAUSSÉES

Contenu normatif



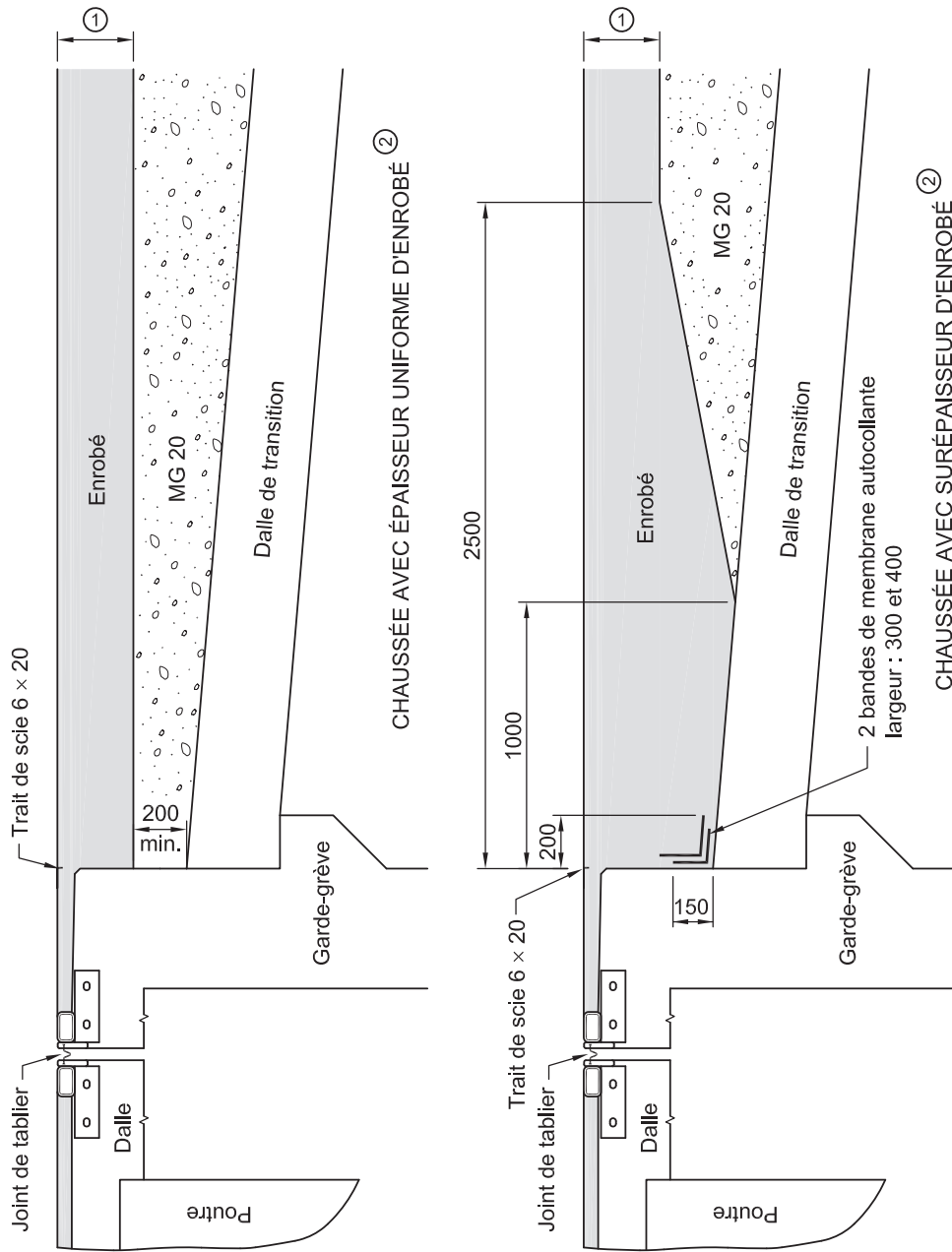
① Sur les profils, on emploiera toujours la dénomination de la ligne la plus haute si les lignes sous-jacentes coïncident avec elle.

| |
|---------------------------|
| Tome II |
| Chapitre 2 |
| Numéro 002 |
| Date 2010 03 30 |

DESSIN NORMALISÉ

**TRANSITION ENTRE UN PONT
(AVEC JOINT DE TABLIER) ET UNE
CHAUSSÉE EN ENROBÉ**

NORME



- ① Épaisseur à déterminer selon le dimensionnement structural de la chaussée.
 ② Lorsqu'il est possible de poser un minimum de 200 mm de MG 20, il faut choisir la chaussée avec épaisseur uniforme d'enrobé. Dans le cas contraire, il faut choisir la chaussée avec surépaisseur d'enrobé.

Note :
 - les cotes sont en millimètres.

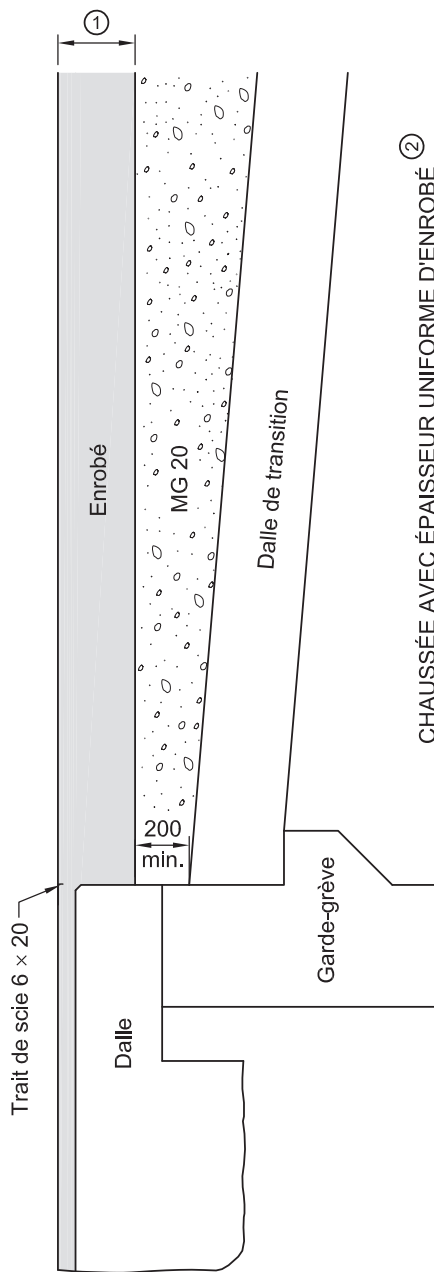
| MATÉRIAUX — NORMES APPLICABLES | |
|---------------------------------------|---|
| Béton | Tome VII, norme 3101 |
| Enrobé | Granulats (MG 20) Matériaux recyclés |
| | Tome VII, norme 4201 |
| | Tome VII, norme 4202 |
| | NQ 2560-114 NQ 2560-600 |



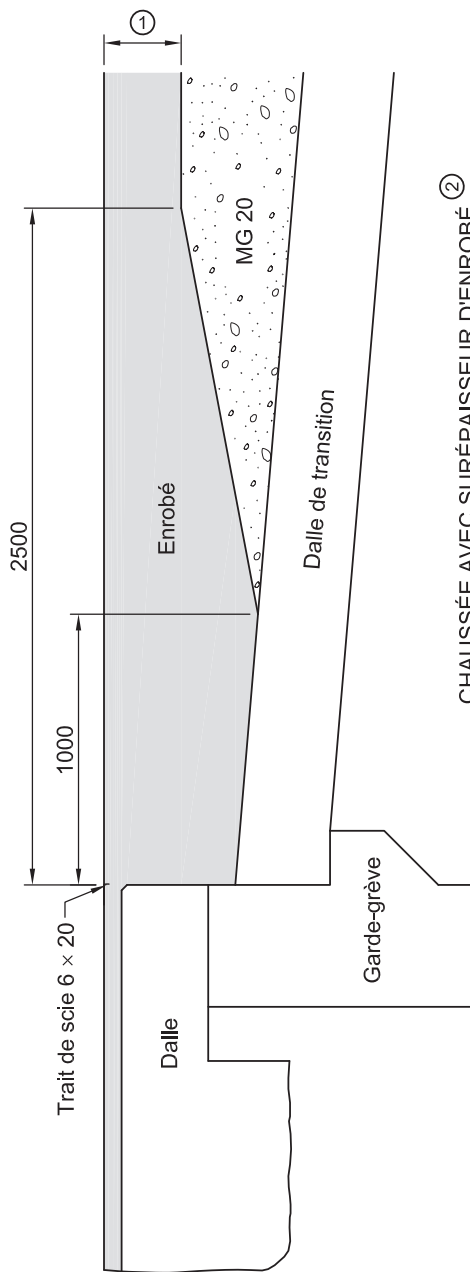
TRANSITION ENTRE UN PONT
(AVEC JOINT DALLE SUR CULÉE)
ET UNE CHAUSÉE EN ENROBÉ

NORME

Contenu normatif



CHAUSÉE AVEC ÉPAISSEUR UNIFORME D'ENROBÉ ②



CHAUSÉE AVEC SURÉPAISSEUR D'ENROBÉ ②

- ① Épaisseur à déterminer selon le dimensionnement structural de la chaussée.
② Lorsqu'il est possible de poser un minimum de 200 mm de MG 20, il faut choisir la chaussée avec épaisseur uniforme d'enrobé. Dans le cas contraire, il faut choisir la chaussée avec surépaisseur d'enrobé.

Note :

– les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

NQ 2560-114
NQ 2560-600

Tome VII, norme 3101
Granulats (MG 20)
Tome VII, norme 4201
Matériaux recyclés
Tome VII, norme 4202

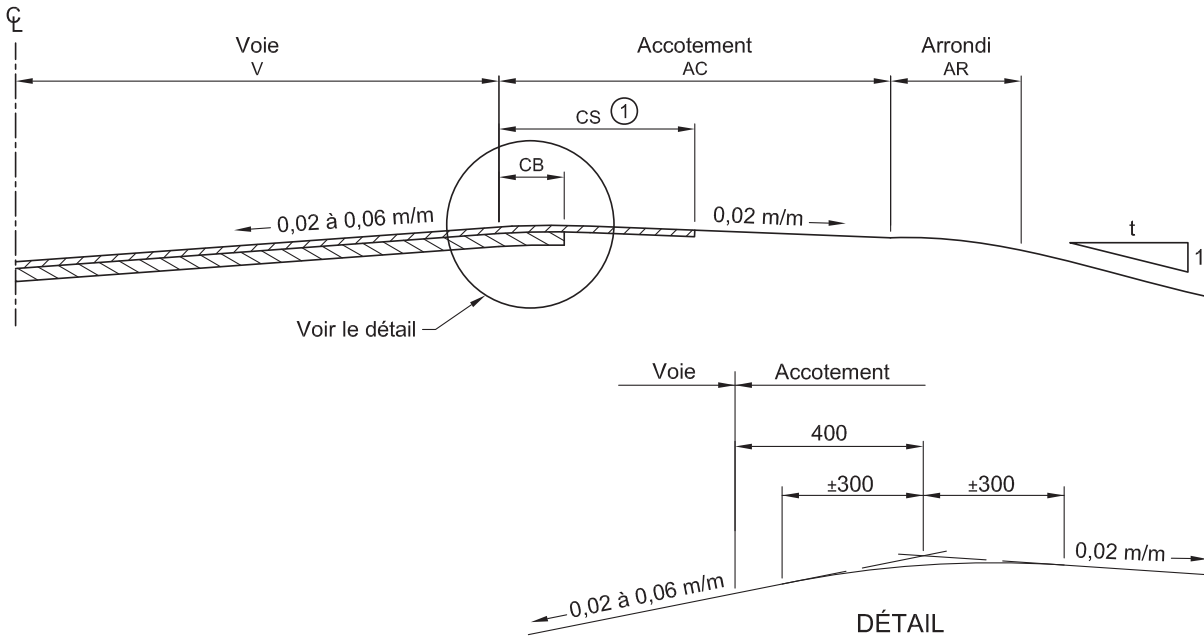
Béton
Enrobé

| |
|---------------------------|
| Tome II |
| Chapitre 2 |
| Numéro 006 |
| Date 2006 10 30 |

DESSIN NORMALISÉ

CHAUSSÉE EN ENROBÉ, ACCOTEMENT – ROUTE EN DÉVERS

NORME



Caractéristiques des accotements

| Type de route | V | AC | AR | CB | t |
|--------------------------------------|------|------|------|-----|---|
| A (accotement droit) | 3700 | 3000 | 1000 | 500 | 6 |
| A (accotement gauche) ⁽¹⁾ | 3700 | 1300 | 1000 | 500 | 6 |
| B | 3700 | 3000 | 1000 | 500 | 4 |
| C | 3500 | 2500 | 300 | 500 | 3 |
| D | 3300 | 2000 | 300 | 500 | 2 |
| E | 3000 | 1500 | 300 | 500 | 2 |
| F | 3000 | 1000 | 300 | 500 | 2 |

1. Le dévers de l'accotement gauche d'une autoroute est le même que celui de la chaussée.

- V : voie
- AC : accotement
- AR : arrondi
- CS : prolongement de la couche de surface sur l'accotement
- CB : prolongement de la couche de base sur l'accotement
- t : pente de talus

① La largeur du recouvrement de l'accotement est donnée à la section 5.6 « Recouvrement de l'accotement » du *Tome I – Conception routière*.

Note :

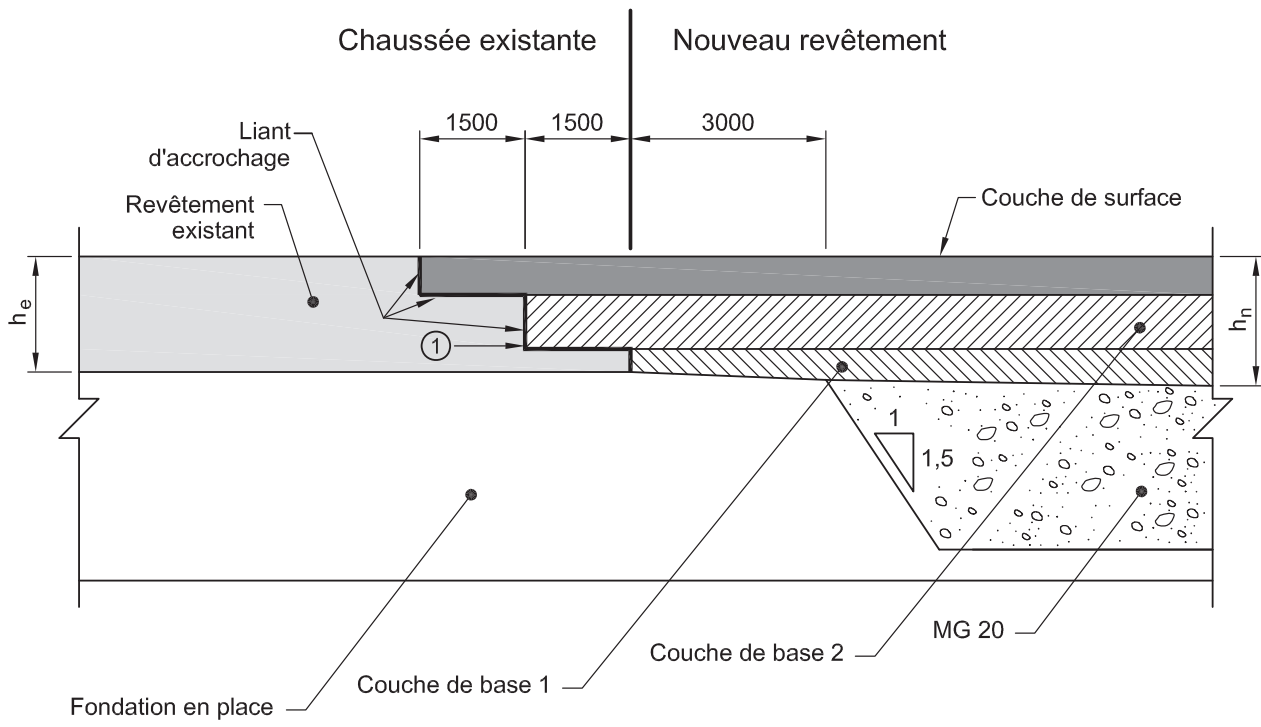
– les cotes sont en millimètres.

| |
|---------------------------|
| Tome II |
| Chapitre 2 |
| Numéro 008 |
| Date 2007 10 30 |

DESSIN NORMALISÉ

**RACCORDEMENT DES
REVÊTEMENTS EN ENROBÉ
(ÉPAISSEUR DU NOUVEAU REVÊTEMENT
SUPÉRIEURE À L'ÉPAISSEUR DU
REVÊTEMENT EXISTANT)**

NORME



$h_n > h_e$

h_e : épaisseur du revêtement existant.
 h_n : épaisseur du nouveau revêtement.

- ① L'épaisseur du revêtement sur le premier palier doit être supérieure à 50 mm, sinon enlever l'enrobé et le remplacer par la couche de base 1.

Note :

– les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

| | | | |
|-------------------|----------------------|--------------------|----------------------|
| Enrobé | Tome VII, norme 4201 | Liant d'accrochage | Tome VII, norme 4105 |
| Granulats (MG 20) | Tome VII, norme 4202 | Matériaux recyclés | NQ 2560–600 |
| | NQ 2560–114 | | |



NORME

DESSIN NORMALISÉ

ISOLATION THERMIQUE – POLYSTYRÈNE

Tome

II

Chapitre

2

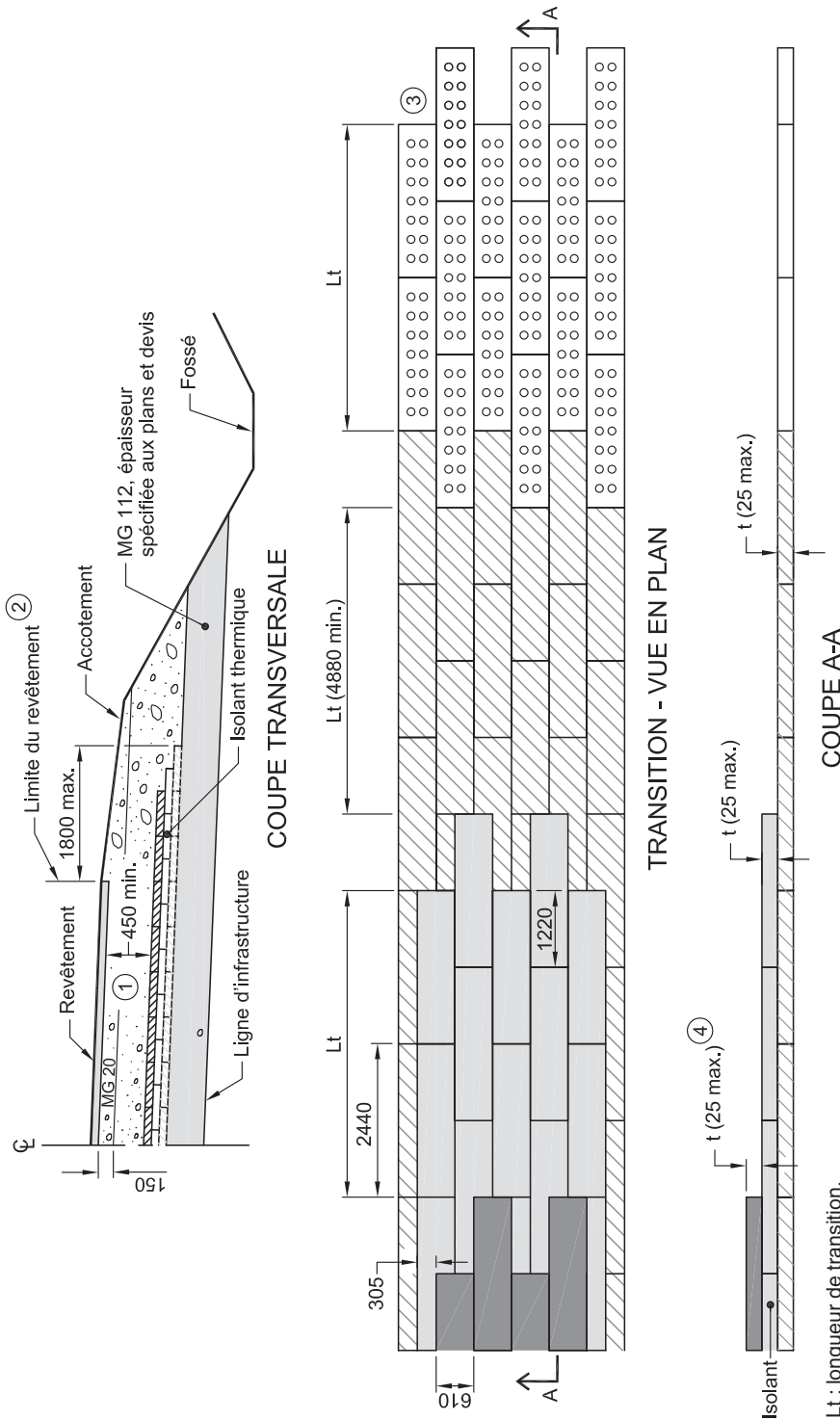
Numéro

029

Date

2014 01 30

Contenu normatif



Lt : longueur de transition.
t : épaisseur de l'isolant thermique.

- ① La première couche de matériaux recouvrant l'isolant doit avoir une épaisseur minimale de 300 mm après compactage. Elle doit être constituée de matériaux de granulométrie MG 20 ou MG 112, dont plus de 30% de particules retenues sur le tamis 5 mm ou de matériaux recyclés des types MR 1 à MR 5. La couche supérieure de la fondation doit être d'une épaisseur de 150 mm au minimum et constituée de MG 20 (voir section 2.7 « Isolation des chaussées »).
- ② L'isolant doit être prolongé jusqu'à 1800 mm du bord du revêtement (le revêtement peut recouvrir une partie ou la totalité de l'accotement) ou sur la pleine largeur de l'accotement, suivant la moindre des deux éventualités.
- ③ Dernier intervalle de transition constitué de panneaux amincis à 10 mm ou perforés uniformément sur 23% de leur superficie. La dimension des trous doit être comprise entre 75 et 200 mm, par exemple 20 trous de 150 mm de diamètre ou 10 trous de 200 mm de diamètre par panneau.
- ④ L'épaisseur d'isolant est spécifiée pour un polystyrène extrudé et doit être multipliée par 1,2 pour un polystyrène expansé, auquel cas on abaisse la ligne d'infrastructure en conséquence.

MATÉRIAUX — NORMES APPLICABLES

| | |
|-------------------|-----------------------|
| Granulats | NQ 2560-114 |
| • MG 20 | NQ 2560-600 |
| • MR 1 à MR 5 | |
| Isolant thermique | |
| • polystyrène | Tome VII, norme 14301 |

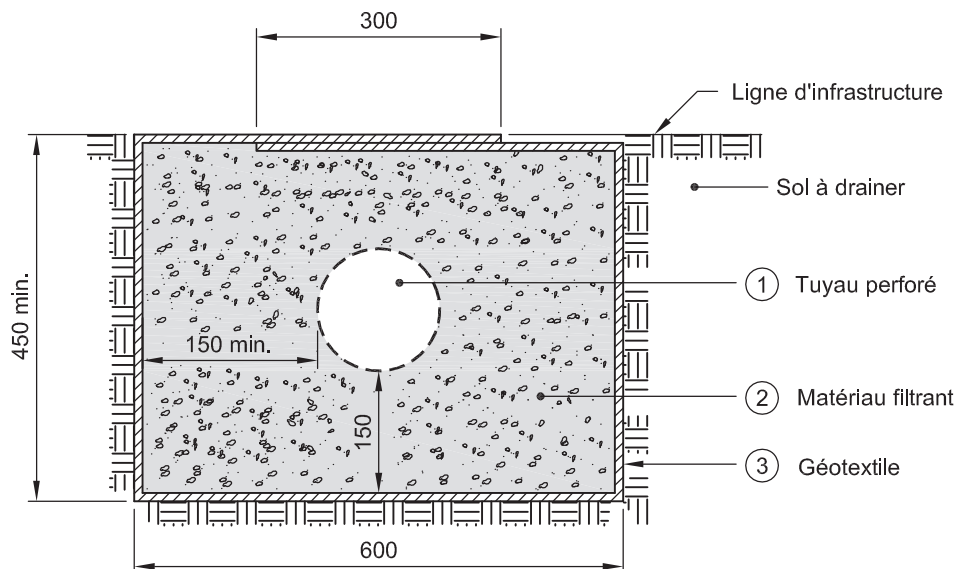
Note :

- les cotes sont en millimètres.



NORME

DRAIN EN PIERRE



- ① Tuyau perforé de 150 ou 200 mm de diamètre (si requis aux plans et devis) :
- matériau : thermoplastique de rigidité égale ou supérieure à 300 kPa;
 - lorsque le drain est relié à un égout pluvial, un tuyau perforé est requis sur toute la longueur du drain et un raccord étanche est nécessaire;
 - l'extrémité amont du tuyau doit être fermée par un bouchon;
 - la profondeur d'installation du tuyau est spécifiée aux plans et devis.
- ② Matériau filtrant :
- avec tuyau à perforations circulaires : granulat BC 5–20;
 - dans tous les autres cas : granulat BC 5–40.
- ③ Géotextile :
- sol à drainer > 50% passant le tamis 80 µm : type III;
 - sol à drainer < 50% passant le tamis 80 µm : type IV.

Note :

- les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

Géotextile

Tome VII, norme 13101

Tuyau en thermoplastique

Granulats (BC 5–20, BC 5–40)

NQ 2560–114

• polyéthylène

BNQ 3624–110, type 2

BNQ 3624–120, type 2

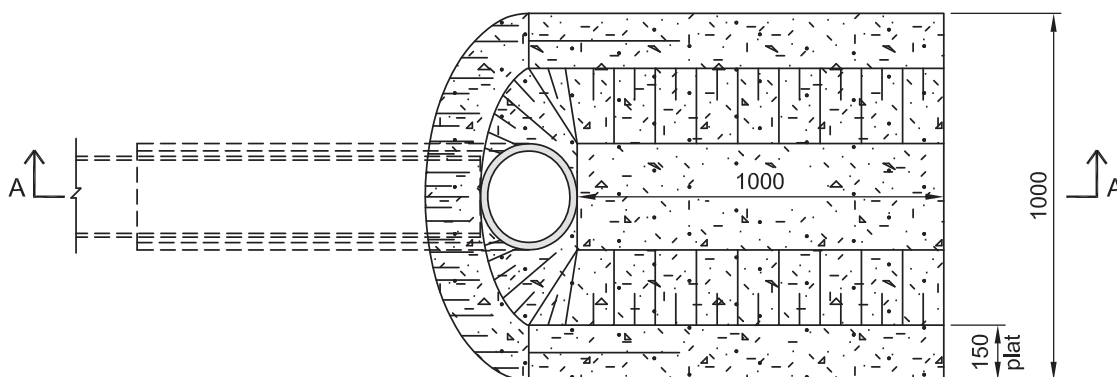
• PVC

NQ 3624–135, type 1 ou 2



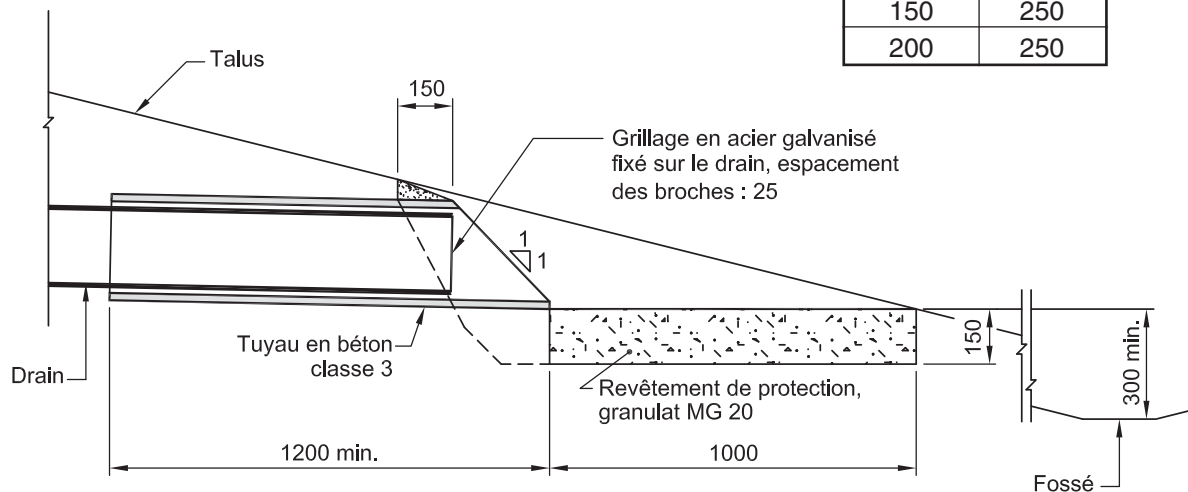
NORME

AMÉNAGEMENT
À LA SORTIE D'UN DRAIN



VUE EN PLAN

| Diamètre du drain (mm) | Diamètre du TB (mm) |
|------------------------|---------------------|
| 150 | 250 |
| 200 | 250 |



COUPE A-A

Note :

- les cotes sont en millimètres.

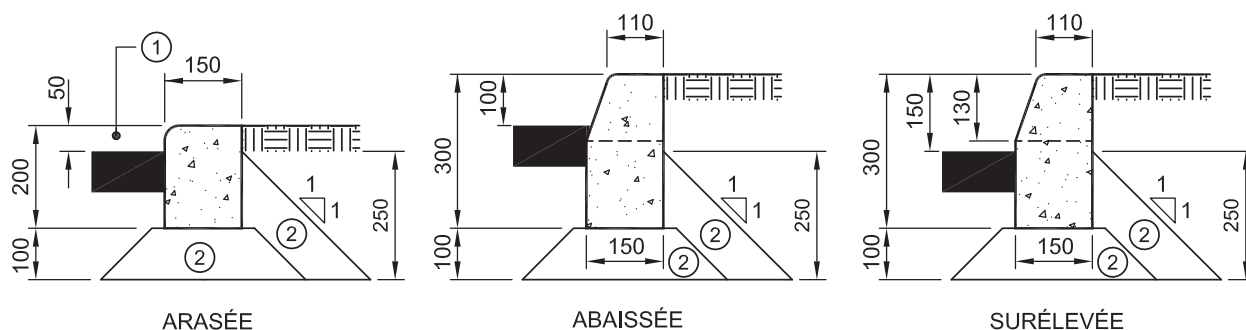
MATÉRIAUX — NORMES APPLICABLES

| | |
|-------------------------|----------------------|
| Cadre, grille et tampon | Tome VII, norme 7202 |
| Granulats (MG 20) | NQ 2560-114 |
| Tuyau en béton | BNQ 2622-126 |



NORME

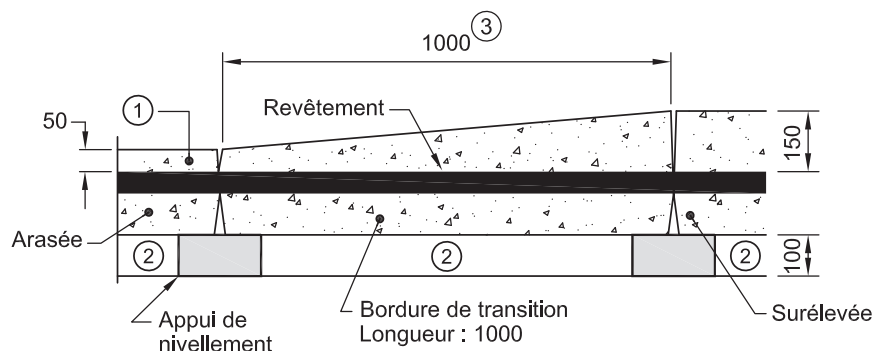
BORDURE PRÉFABRIQUÉE
EN BÉTON



ARASÉE

ABAISSÉE

SURÉLEVÉE



BORDURE DE TRANSITION

- ① Lorsque la bordure arasée est juxtaposée à un trottoir ou à une entrée en pente ascendante, la hauteur au-dessus du revêtement est de 25 mm. Elle est de 5 mm à l'endroit d'un accès universel et à la rencontre d'une piste cyclable.
- ② Coussin de support et appui en béton (type XII).
- ③ Les bordures de transition de 1200 mm de longueur sont également acceptées.

Notes :

- les abouts des bordures présentent des surfaces planes et l'ouverture au joint est inférieure à 10 mm;
- la déviation dans l'alignement des faces apparentes de deux éléments de bordure consécutifs est inférieure à 3 mm;
- pour des rayons de courbure inférieurs à 25 m, des éléments de bordure courbes sont utilisés;
- le matériau granulaire utilisé dans la fondation (d'une épaisseur minimale de 150 mm) doit être un MG 20 ou un MR 5 dont la granulométrie est conforme au fuseau granulométrique du MG 20;
- la réfection derrière les bordures est effectuée à l'aide de matériaux de même nature que les matériaux avoisinants;
- les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

Béton, type XII
Bordure préfabriquée en béton

Tome VII, norme 3101
BNQ 2624-210

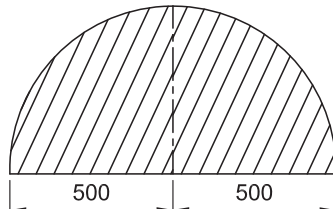
Granulats
• MG 20
• MR 5 (correspondant à un MG 20)

BNQ 2560-114
NQ 2560-600

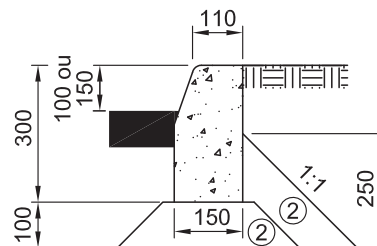
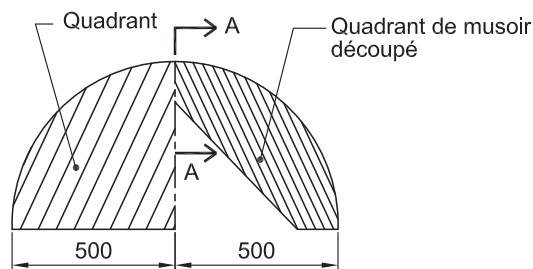


NORME

MUSOIR R 500

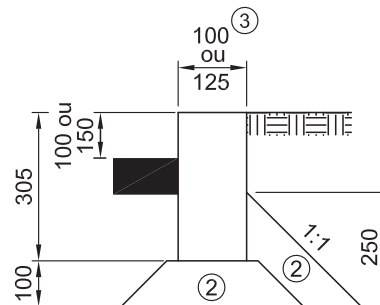
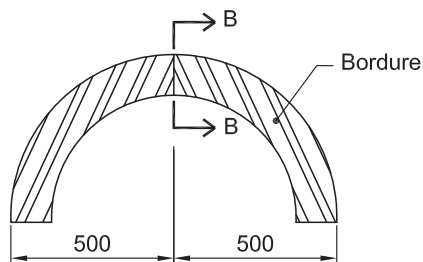


ABAISSÉ OU SURÉLEVÉ COULÉ EN PLACE EN BÉTON^①



COUPE A-A

ABAISSÉ OU SURÉLEVÉ PRÉFABRIQUÉ EN BÉTON



COUPE B-B

ABAISSÉ OU SURÉLEVÉ EN GRANITE

- ① La face apparente du musoir doit correspondre à la forme de bordure de la hauteur correspondante présentée au dessin normalisé II-4-003.
- ② Coussin de support et appui en béton (type XII).
- ③ Pour les musoirs surélevés en granite, seule la largeur de 125 est permise.

Notes :

- les éléments de musoirs préfabriqués en béton sont disponibles sous la forme d'un quadrant et d'un quadrant découpé;
- si requis, prévoir une gaine ou un autre dispositif dans le musoir pour permettre l'installation de la petite signalisation;
- les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

Béton, type XII
Musoir préfabriqué en béton

Tome VII, norme 3101
BNQ 2624-210

Musoir en granite

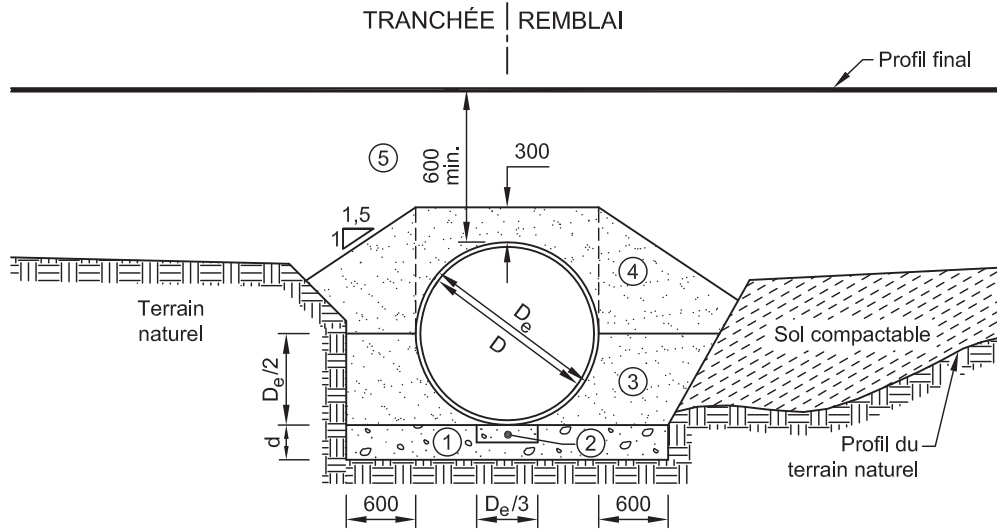
Tome VII, norme 14201

| |
|---------------------------|
| Tome III |
| Chapitre 4 |
| Numéro 002 |
| Date 2014 01 30 |

DESSIN NORMALISÉ

INSTALLATION DES TUYAUX EN BÉTON ARMÉ (TBA) ET NON ARMÉ (TBNA), ASSISE EN MATÉRIAUX GRANULAIRES (RÉSEAU ROUTIER)

NORME



D_e : diamètre extérieur
 D : diamètre nominal
 d : épaisseur du coussin de support

| D (mm) | d (mm) | |
|-------------|----------------|-----|
| | Dépôts meubles | Roc |
| ≤ 1050 | 150 | 200 |
| 1200 à 2400 | 200 | 300 |
| ≥ 2700 | 300 | 400 |

- ① Coussin de support en MG 20 densifié au minimum à 95 % de la masse volumique sèche maximale par couches de 150 mm. Si le fond de l'excavation est composé de matériaux granulaires pouvant être densifiés à 95 % de la masse volumique sèche maximale, le coussin de support n'est pas nécessaire.
- ② Partie du coussin de support non densifiée sur une couche de 150 mm d'épaisseur.
- ③ Remblai latéral en MG 20 ou CG 14 densifié au minimum à 90 % de la masse volumique sèche maximale par couches de 150 mm.
- ④ Recouvrement de protection en MG 20 ou CG 14 densifié au minimum à 90 % de la masse volumique sèche maximale par couches de 300 mm.
- ⑤ Remblayage avec les matériaux de l'excavation ou un sol compactable. Le matériau de remblayage doit être densifié au minimum à 90 % de la masse volumique sèche maximale par couches de 300 mm.

Notes :

- les joints entre les éléments doivent être étanches ou recouverts d'un géotextile de type III, d'une largeur de 1 m et d'une longueur égale à 1,3 fois le périmètre extérieur de l'ouvrage;
- comme matériel de compactage, seuls les dameuses, les plaques vibrantes et les rouleaux à tambours vibrants, dont la force totale appliquée ne doit pas dépasser 50 kN pour le premier mètre au-dessus du tuyau, sont permis;
- les pentes de transition de la ligne d'infrastructure doivent être faites selon les exigences du *Tome II – Construction routière*, chapitre 1 « Terrassement »;
- l'excavation doit répondre aux exigences de la CSST en matière de stabilité des pentes;
- les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

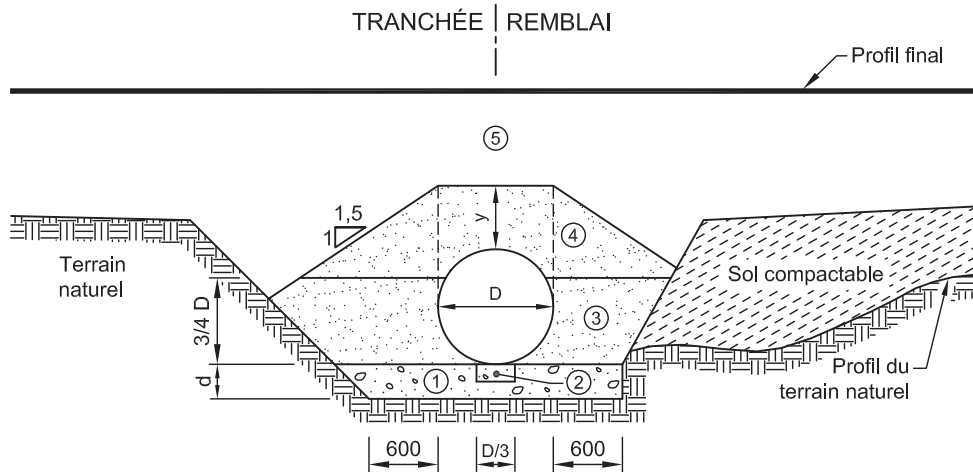
Granulats
 • MG 20
 • CG 14

— NQ 2560–114

Géotextile
 Tuyau en béton armé et non armé

Tome VII, norme 13101
 BNQ 2622–126

INSTALLATION DES TUYAUX EN TÔLE ONDULÉE (TTO) CIRCULAIRES – ASSISE EN MATÉRIEAUX GRANULAIRES (RÉSEAU ROUTIER)



| D (mm) | d (mm) | |
|-------------|----------------|-----|
| | Dépôts meubles | Roc |
| 300 à 600 | 150 | 300 |
| 700 à 1000 | 200 | 300 |
| 1200 à 2000 | 300 | 400 |
| > 2000 | 400 | 500 |

Recouvrement de protection minimal au-dessus du tuyau en fonction de son diamètre

| Type de circulation | D (mm) | y (mm) |
|---------------------------------------|--------|--------------------------------|
| Circulation de matériel de compactage | ≤ 900 | 300 (Acier) 450 (Aluminium) |
| | > 900 | $\frac{D}{4} + 300$ |
| Circulation de véhicule | ≤ 1200 | 600 |
| | > 1200 | $\frac{D}{4} + 300$ |

D : diamètre nominal

d : épaisseur du coussin de support

y : épaisseur du recouvrement de protection CG 14 au-dessus du tuyau

- ① Coussin de support en MG 20 densifié au minimum à 95% de la masse volumique sèche maximale par couches de 150 mm.
- ② Partie du coussin de support non densifiée sur une couche de 150 mm d'épaisseur.
- ③ Remblai latéral en CG 14 densifié au minimum à 90% de la masse volumique sèche maximale par couches de 150 mm.
- ④ Recouvrement de protection en CG 14 densifié au minimum à 90% de la masse volumique sèche maximale par couches de 300 mm.
- ⑤ Remblayage avec les matériaux de l'excavation ou un sol compactable. Le matériau de remblayage doit être densifié au minimum à 90% de la masse volumique sèche maximale par couches de 300 mm.

Notes :

- les joints doivent être étanches ou recouverts d'un géotextile de type III, d'une largeur de 1 m et d'une longueur égale à 1,3 fois le périmètre extérieur de l'ouvrage;
- si le sol de fondation sur lequel repose l'assise est composé de sable lâche, d'argile molle, de sol organique ou de silt facilement remaniable, la conception structurale du tuyau est à vérifier;
- le matériel de compactage ne doit pas circuler dans la zone de 300 mm d'épaisseur immédiatement au-dessus du tuyau;
- comme matériel de compactage, seuls les dameuses, les plaques vibrantes et les rouleaux à tambours vibrants, dont la force totale appliquée ne doit pas dépasser 50 kN pour le premier mètre au-dessus du tuyau, sont permis;
- les pentes de transition doivent être faites selon les exigences du *Tome II – Construction routière*, chapitre 1 « Terrassement »;
- l'excavation doit répondre aux exigences de la CSST en matière de stabilité des pentes;
- les cotes sont en millimètres.

MATÉRIEAUX — NORMES APPLICABLES

Granulats (CG 14)
Géotextile

BNQ 2560-114
Tome VII, norme 13101

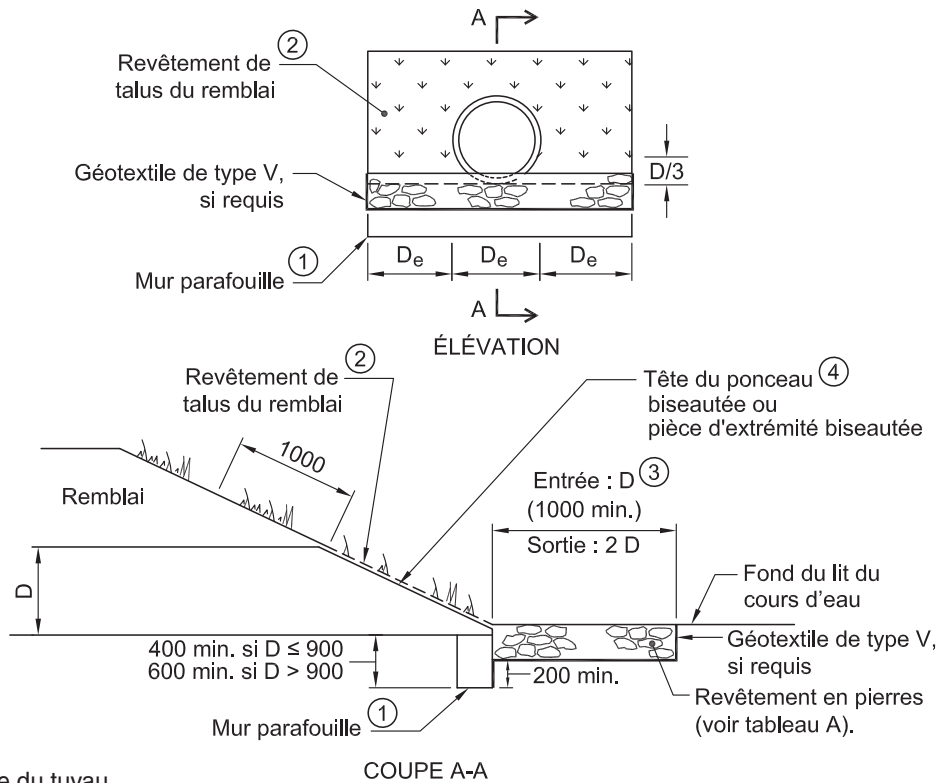
Tuyau en tôle ondulée

Tome VII, norme 7101

DESSIN NORMALISÉ

AMÉNAGEMENT DES EXTRÉMITÉS
BISEAUTÉES, PONCEAUX CIRCULAIRES
DE 1200 mm ET MOINS DE DIAMÈTRE

NORME



D : diamètre du tuyau

 D_e : diamètre extérieur du tuyau

① Mur parafeuille :

- pièces de bois traité de 200 × 200 mm assemblées à l'aide de clous tous les 600 mm;

ou

- mur en béton préfabriqué ou coulé en place (voir détail A du dessin normalisé 014).

② Revêtement de talus du remblai :

- plaques de gazon;

ou

- pierres avec ou sans géotextile de type V (voir tableau A).

③ Dans le cas de ponceaux se drainant dans les fossés de la route, la valeur d'entrée ou de sortie est de 1000 mm et la protection de fossé doit se faire en conformité avec le *Tome IV – Abords de route*, chapitre 8 « Revêtements de protection ».

④ L'extrémité du tuyau peut être biseautée lorsqu'il est en béton non armé. Pour les pièces d'extrémité en béton, voir le dessin normalisé 011. Pour les pièces d'extrémité biseautées métalliques et en polyéthylène, le mur parafeuille est situé sous la dernière feuille de tuyau.

Notes :

- les tôles en aluminium mises en contact avec du béton coulé en place doivent être protégées à l'aide d'une membrane autocollante pour joints (sans gravillons) posée entre le béton et l'aluminium;
- les cotes sont en millimètres.

Tableau A

| Revêtement en pierres | | | |
|-----------------------|--------------|---------------|----------------|
| Type | Calibre (mm) | D_{50} (mm) | Épaisseur (mm) |
| 1 | 0-200 | 100 | 300 |
| 2 | 100-200 | 150 | 300 |
| 3 | 200-300 | 250 | 500 |
| 4 | 300-400 | 350 | 700 |
| 5 | 300-500 | 400 | 800 |

MATÉRIAUX — NORMES APPLICABLES

Bois
GéotextileTome VII, norme 11101
Tome VII, norme 13101

Plaques de gazon

Tome VII, norme 9101



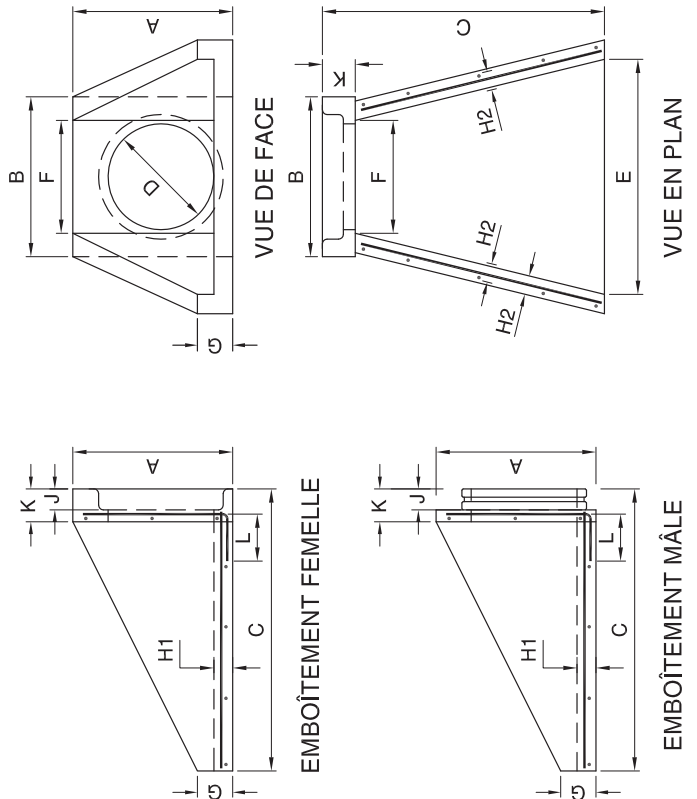
PIÈCE D'EXTRÉMITÉ BISEAUTÉE
EN BÉTON

NORME

Contenu normatif

Caractéristiques géométriques

| D | A | B | C | E | F | G | Hauteur muret | Orifice | Largeur avant | Épaisseur (mm) | | Profondeur cloche | Largeur jonction | Chevauchement armature | Armature |
|------|------|------|------|------|------|-----|------------------|---------|------------------|----------------|-----|----------------------|---------------------|---------------------------|---|
| | | | | | | | | | | dalle | mur | | | | |
| 450 | 700 | 700 | 1200 | 994 | 494 | 170 | 100 | H1 | H2 | 100 | 89 | 200 | 200 | Mur et dalle | 10 M à 300 (2 sens) |
| 610 | 832 | 832 | 1400 | 1000 | 630 | 170 | 100 | 100 | 100 | 89 | 89 | 200 | 200 | Mur et dalle | 10 M à 300 (2 sens) |
| 762 | 1200 | 1300 | 2000 | 1547 | 1047 | 200 | 150 | 150 | 125 | 89 | 89 | 250 | 250 | Mur | 15 M à 300 (verticale) 10 M à 300 (horizontale) |
| 915 | 1200 | 1300 | 2000 | 1547 | 1047 | 200 | 150 | 150 | 125 | 89 | 89 | 250 | 250 | Dalle | 10 M à 300 (2 sens) |
| 1050 | 1644 | 1538 | 2200 | 2150 | 1230 | 250 | 150 | 150 | 150 | 102 | 102 | 250 | 300 | Mur | 15 M à 300 (verticale) 10 M à 300 (horizontale) |
| 1200 | 1644 | 1538 | 2200 | 2150 | 1230 | 250 | 150 | 150 | 150 | 102 | 102 | 250 | 300 | Dalle | 10 M à 200 (transversale) 10 M à 300 (longitudinale) |
| | | | | | | | | | | | | | | Mur | 15 M à 180 (verticale) 10 M à 300 (horizontale) |
| | | | | | | | | | | | | | | Dalle | 10 M à 200 (transversale) 10 M à 300 (longitudinale) |



MATÉRIAUX — NORMES APPLICABLES

Acier d'armature

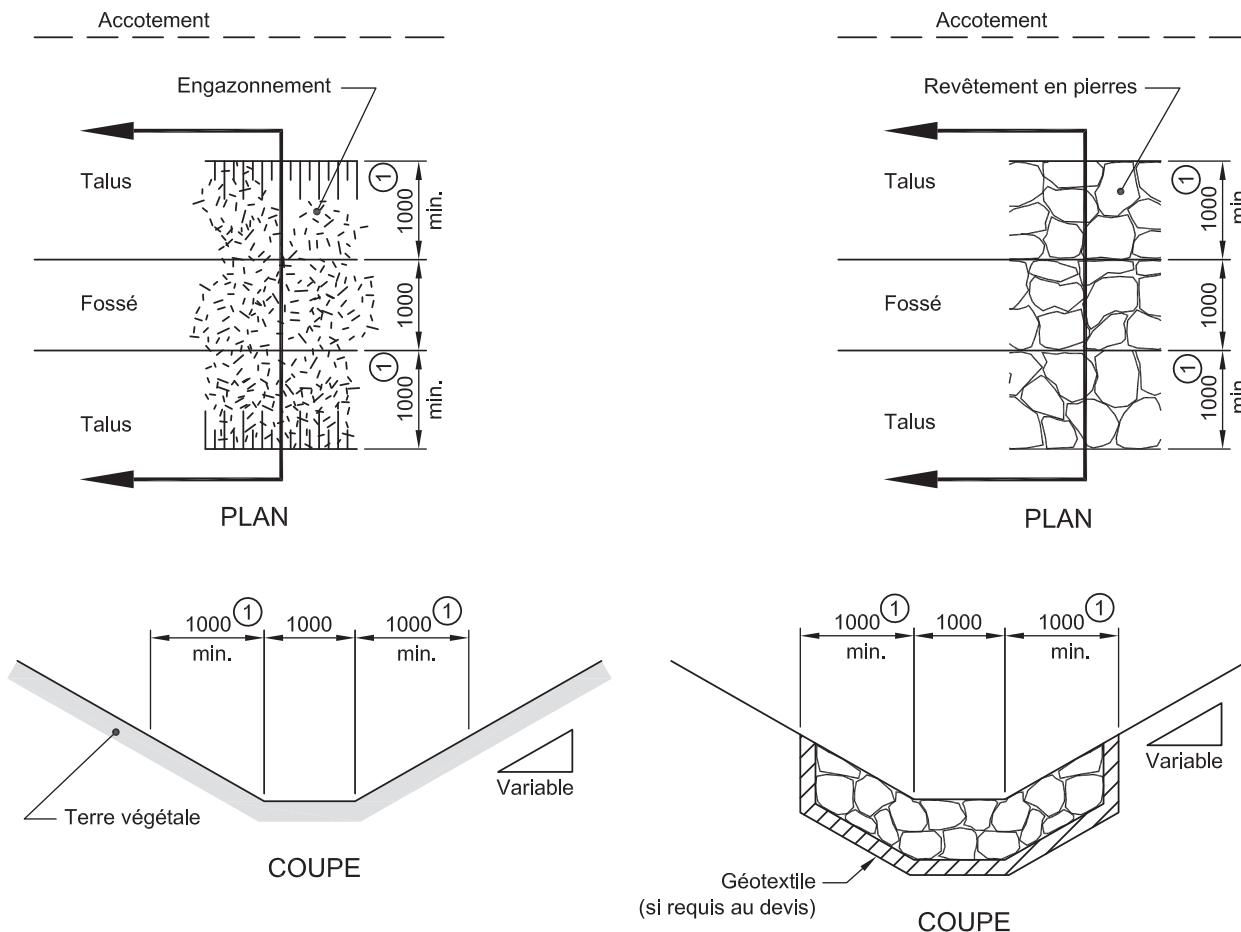
Béton

Tome VII, norme 5101

Tome VII, norme 3101

NORME

REVÊTEMENT DE PROTECTION POUR FOSSÉS



Revêtement en pierres

| Type | Calibre (mm) | D ₅₀ (mm) | Épaisseur (mm) | Vitesse maximale (m/s) |
|------|--------------|----------------------|----------------|------------------------|
| 1 | 200-0 | 100 | 300 | 2,0 ② |
| 2 | 200-100 | 150 | 300 | 2,3 |
| 3 | 300-200 | 250 | 500 | 2,9 |
| 4 | 400-300 | 350 | 700 | 3,2 |
| 5 | 500-300 | 400 | 800 | 3,4 |

① La largeur de protection varie selon la pente et la hauteur d'eau dans le fossé.

② Lorsque la vitesse est inférieure à 2,0 m/s, l'engazonnement peut être utilisé comme revêtement.

Note :

– les cotes sont en millimètres.

MATÉRIAU — NORME APPLICABLE

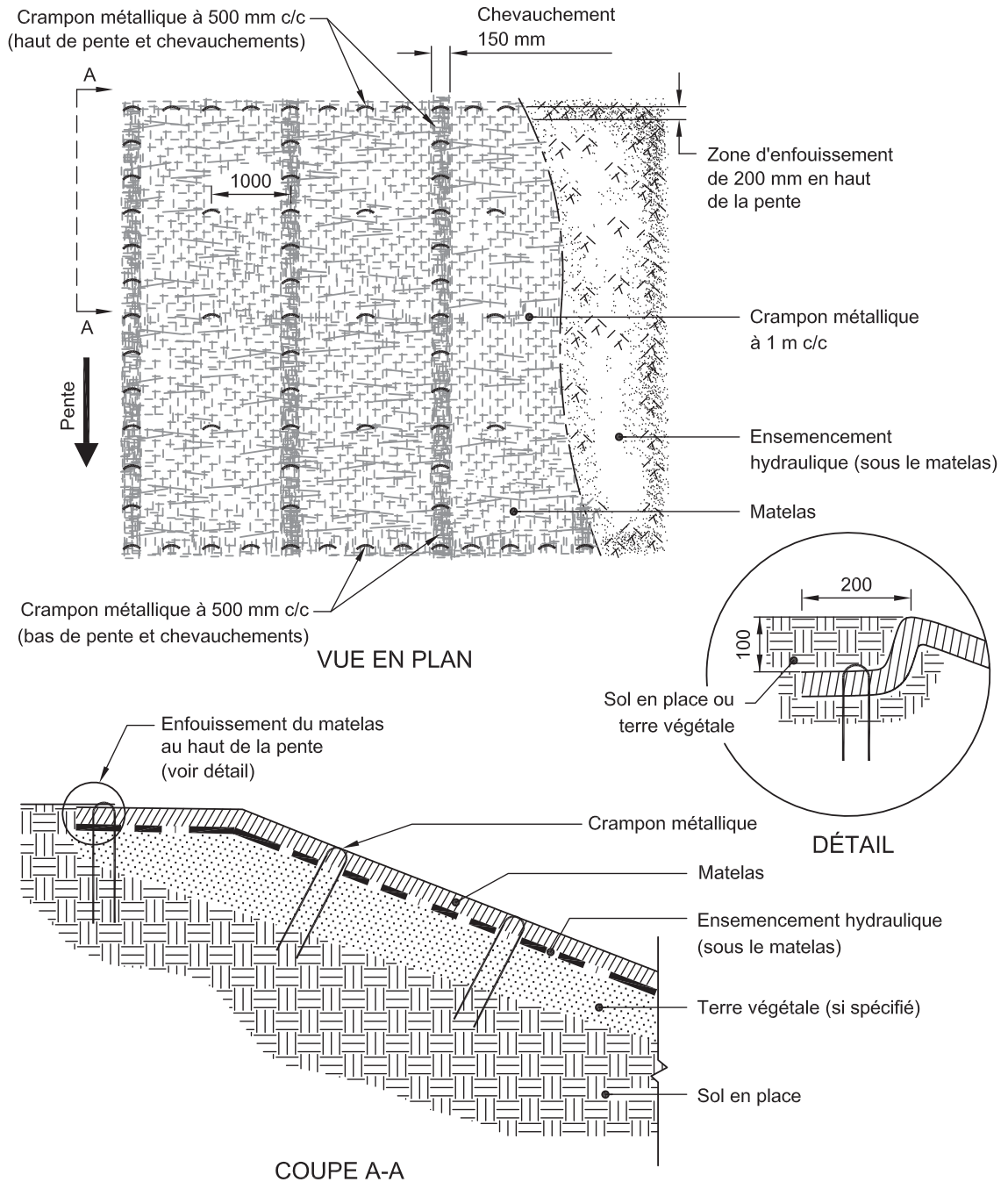
Géotextile
Revêtement en pierres

Tome VII, norme 13101
Tome VII, norme 14501



NORME

ENSEMENCEMENT HYDRAULIQUE PROTÉGÉ PAR UN MATELAS DE FIBRES DE BOIS OU DE PAILLE (H-3)



MATÉRIAUX — NORME APPLICABLE

| | |
|--------------------|----------------------|
| Crampon métallique | Tome VII, norme 9101 |
| Matelas | |
| Semences | |
| Terre végétale | |

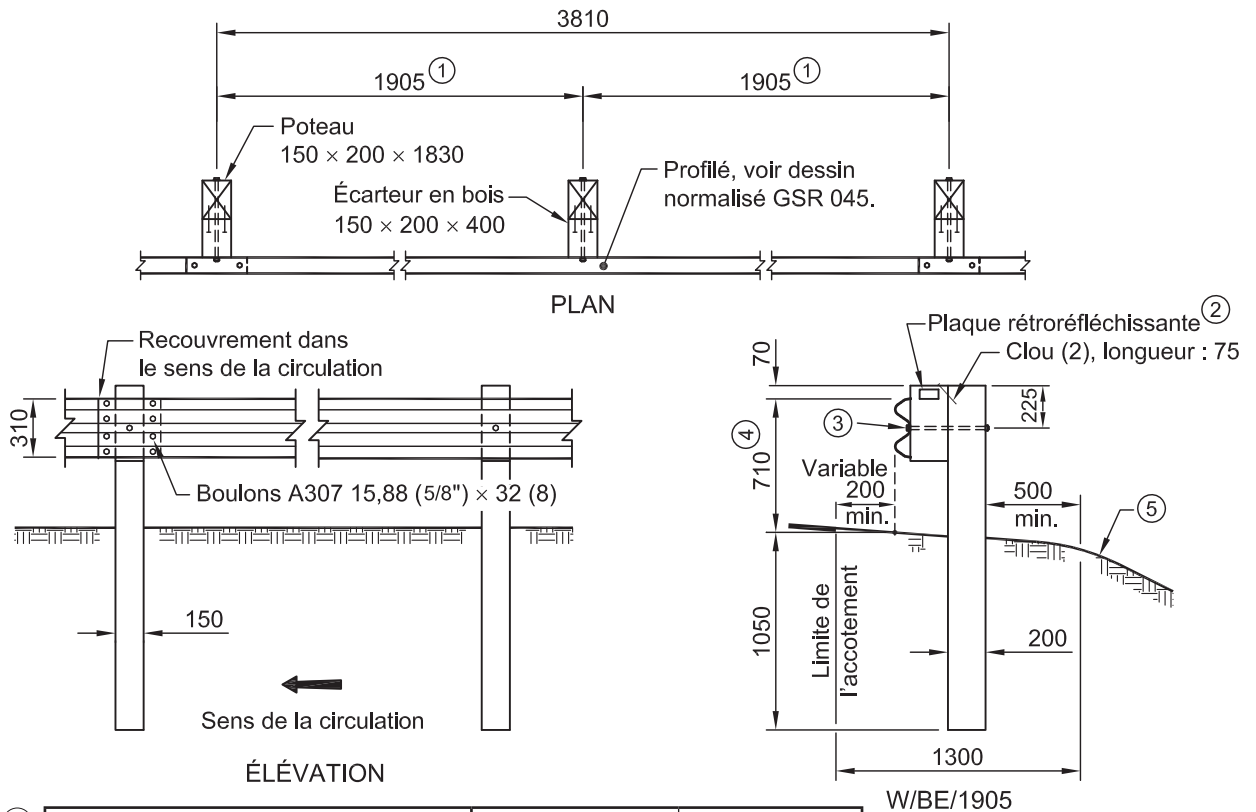
Note :

— les cotes sont en millimètres.



GLISSIÈRE SEMI-RIGIDE
AVEC PROFILÉ D'ACIER
À DOUBLE ONDULATION
SUR POTEAUX DE BOIS

NORME



| | | | |
|---|------------------------------------|------|-----|
| ① | Espacement des poteaux (mm) | 1905 | 952 |
| | Déformation dynamique (mm) | 900 | 600 |

- ② Sur tous les deux poteaux, une plaque rétro réfléchissante de 50×100 mm doit être posée. La pellicule auto-adhésive est fixée sur un support d'aluminium dont le dos est peint. Elle est maintenue à l'aide de clous de 20 mm (4). La pellicule est de couleur blanche à droite de la route et jaune à gauche.
- ③ L'assemblage nécessite un boulon A307 15,88 (5/8")×457 mm, avec écrou et rondelle.
- ④ En présence d'une bordure, la hauteur fonctionnelle de la glissière doit être mesurée conformément à la figure 3.4-2.
- ⑤ Pente de 1V:2H ou plus douce. Dans le cas d'une pente plus abrupte, les poteaux doivent être placés de manière à ce que la distance entre la face avant de l'élément de glissement et le bord du talus soit égale ou supérieure à la déformation dynamique de la glissière.

Notes :

- le traitement des extrémités pour une route où la vitesse affichée est de 50 km/h et moins doit être effectué conformément au dessin normalisé GSR 002. Pour une route où la vitesse affichée est supérieure à 50 km/h, un dispositif d'extrémité de glissière semi-rigide doit être utilisé;
- toutes les pièces métalliques doivent être galvanisées;
- le détail des boulons est indiqué au dessin normalisé GSR 050;
- les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

Bois
Boulons, tiges d'ancrage,
écrous et rondelles
Clous

Tome VII, norme 11101
Tome VII, norme 6201
ASTM F1667

Éléments de glissement
Galvanisation
Pellicules rétro réfléchissantes, type XI

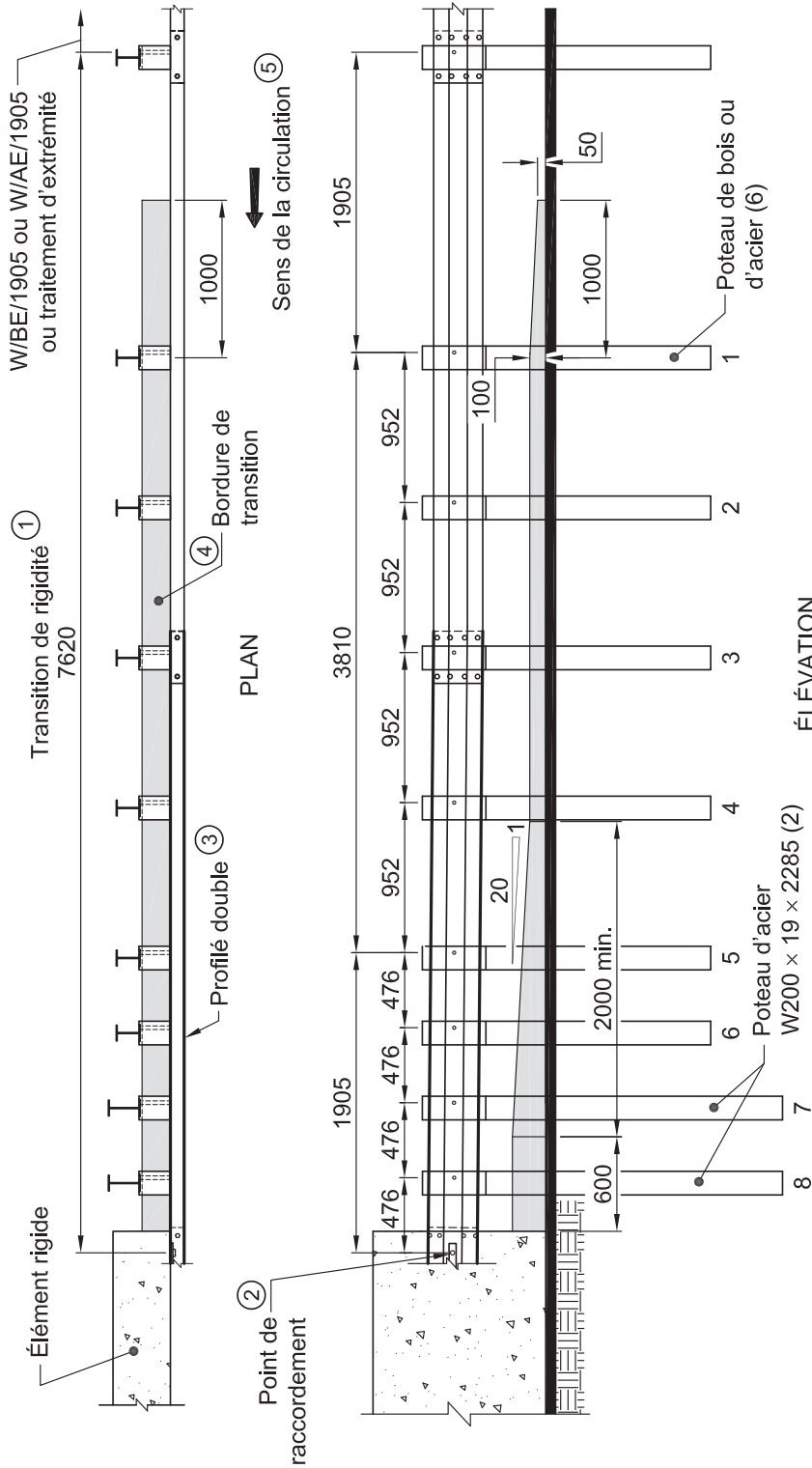
Tome VII, norme 6301
ASTM A123/A123M
Tome VII, norme 14101

| |
|---------------------------|
| Tome VIII |
| Chapitre 3 |
| Numéro GSR 010A |
| Date 2014 09 30 |

DESSIN NORMALISÉ

GLISSIÈRE SEMI-RIGIDE LATÉRALE AVEC PROFILÉ D'ACIER À DOUBLE ONDULATION – TRANSITION DE RIGIDITÉ TL-3

NORME



MATÉRIAUX — NORMES APPLICABLES

| | |
|---|-----------------------|
| Aciers de construction, type V, limite élastique minimale 260 MPa | Tome VII, norme 6101 |
| Béton | Tome VII, norme 3101 |
| • bordure coulée, type IV ou V | Tome VII, norme 11101 |
| • bordure moulée, type VI ou VII | Tome VII, norme 6201 |
| Bois | ASTM F1667 |
| Boulons, tiges d'ancrage, écrous et rondelles | Tome VII, norme 6301 |
| Cioux | ASTM A123/A123M |
| Éléments de glissement | Tome VII, norme 14101 |
| Galvanisation | |
| Pellicules rétro réfléchissantes, type XI | |

- ① Lorsque la glissière semi-rigide est raccordée à une glissière rigide latérale dont l'origine est conforme aux dessins normalisés GR 010 et GR 011, la transition est exécutée conformément au dessin normalisé GSR 012A.
- ② Les détails du raccordement correspondant à l'élément rigide en présence sont indiqués aux dessins normalisés GSR 016 à GSR 018 et GSR 020 à GSR 026B.
- ③ Cette section de la transition de rigidité nécessite l'utilisation de deux profilés d'acier à double ondulation emboîtés.
- ④ La bordure de transition doit être réalisée conformément au Tome II – Construction routière, chapitre 4 « Bordures ». Elle est prolongée, au besoin, pour améliorer le drainage. Une transition de forme et de dimensions doit être réalisée pour l'adapter au chasse-route de l'élément rigide.
- ⑤ Sur une route unidirectionnelle, la transition de rigidité n'est pas requise à la sortie de la structure ou à la fin de la glissière rigide.

Notes :

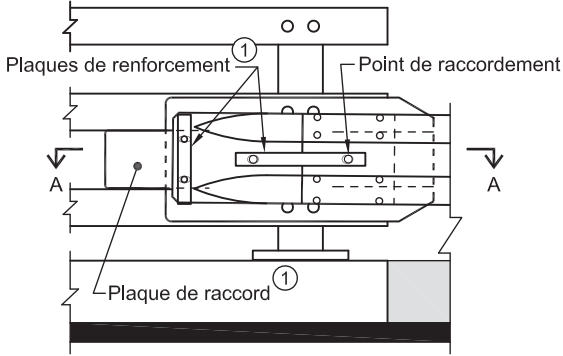
- la transition de rigidité n'est pas requise à l'approche d'un pont acier-bois;
- les cotes sont en millimètres.

| |
|---------------------------|
| Tome VIII |
| Chapitre 3 |
| Numéro GSR 024 |
| Date 2014 09 30 |

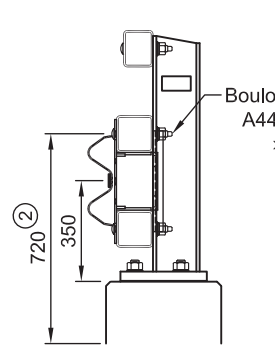
DESSIN NORMALISÉ

**GLISSIÈRE SEMI-RIGIDE AVEC
PROFILÉ D'ACIER À DOUBLE
ONDULATION – RACCORDEMENT
AUX GLISSIÈRES DE PONT DE
TYPE 210**

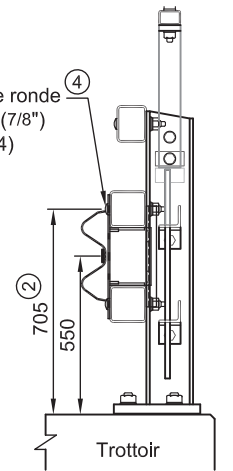
NORME



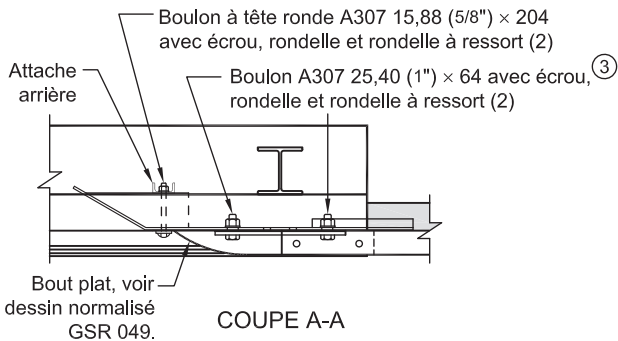
ÉLEVATION



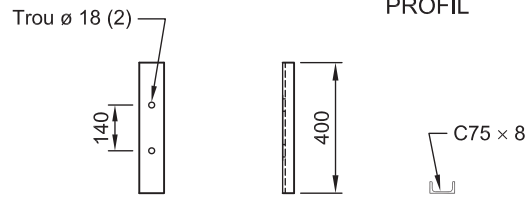
TYPES 210A, 210D ET 210E
PROFIL



TYPES 210B ET 210C
PROFIL



COUPE A-A



ÉLEVATION PROFIL PLAN

ATTACHE ARRIÈRE

- ① Détail des plaques, voir le dessin normalisé GSR 025.
- ② En raison du raccordement avec la structure, la hauteur du profilé diffère de la hauteur fonctionnelle de 710 mm, mais elle demeure à l'intérieur de la tolérance de ± 75 mm. Une transition de hauteur doit minimalement être effectuée sur la dernière longueur de profilé (3810 mm).
- ③ Le trou du profilé doit être agrandi à 27 mm pour recevoir le boulon de 25,40 mm (1").
- ④ La plaque de raccord est fixée au moyen des boulons A449 servant à l'assemblage des tubes au premier poteau de la glissière de pont. Les boulons existants doivent, au besoin, être remplacés par des boulons A449 plus longs afin de prendre en considération l'épaisseur de la plaque de raccord.

Notes :

- toutes les pièces métalliques doivent être galvanisées;
- la réparation de la galvanisation doit être effectuée en appliquant, au pinceau, deux couches d'un enduit riche en zinc avec une teneur minimale de 87% de zinc métallique dans le film sec;
- après le serrage, l'extrémité filetée des boulons doit excéder l'écrou d'au moins 3 mm. Pour respecter cette exigence, les boulons de la glissière de pont doivent être remplacés par des boulons plus longs;
- le détail des boulons est indiqué au dessin normalisé GSR 050;
- les cotes sont en millimètres.

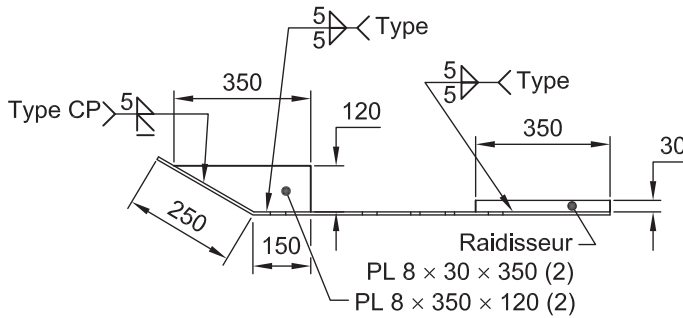
MATÉRIAUX — NORMES APPLICABLES

| | | | |
|--|----------------------|---|---|
| Aciers de construction, type W, limite élastique minimale 260 MPa | Tome VII, norme 6101 | Éléments de glissement Galvanisation | Tome VII, norme 6301 ASTM A123/A123M |
| Boulons, tiges d'ancrage, écrous et rondelles | Tome VII, norme 6201 | | |

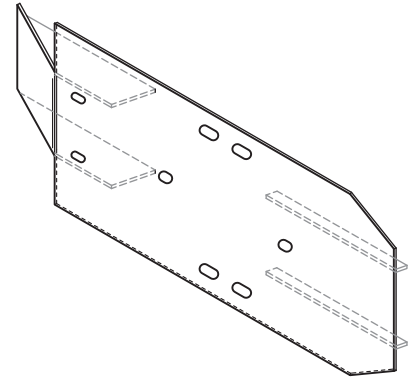


GLISSIÈRE SEMI-RIGIDE AVEC PROFILÉ
D'ACIER À DOUBLE ONDULATION –
RACCORDEMENT AUX GLISSIÈRES
DE PONT DE TYPE 210,
PLAQUE DE RACCORD

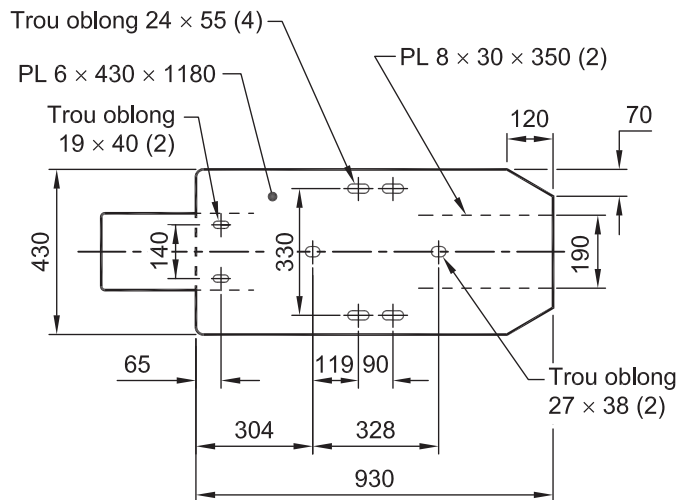
NORME



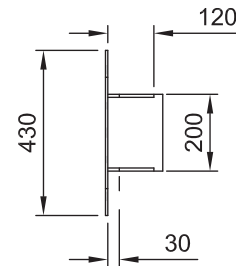
PLAN



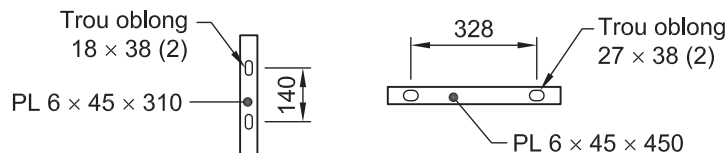
VUE ISOMÉTRIQUE



ÉLÉVATION



PROFIL



PLAQUES DE RENFORCEMENT

Notes :

- toutes les pièces métalliques doivent être galvanisées;
- les cotes sont en millimètres.

MATÉRIAUX — NORMES APPLICABLES

Aciers de construction, type W,
limite élastique minimale 260 MPa

Tome VII, norme 6101

Galvanisation
Soudures

ASTM A123/A123M
CSA W59

Section C Geotechnical study reports



Sols et matériaux
Environnement
Science du bâtiment
Qualité de l'approvisionnement

Dessau

Reconnaissance des sols organiques Tronçon 2, Parc Forillon

Rapport d'étude géotechnique

Date : 8 juillet 2014


N/Réf. : 073-P-0006391-0-01-100-GE-R0001-00

Dessau

Reconnaissance des sols organiques Tronçon 2, Parc Forillon

Rapport d'étude géotechnique | P-0006391-0-01-100

Préparé par :


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| 1 copie électronique | Dessau M. Serge Alarie, ing. | serge.alarie@dessau.com |

1 INTRODUCTION

Dessau a retenu les services de LVM, une division d'EnGlobe Corp., consultants en géotechnique et en ingénierie des matériaux, pour effectuer une étude géotechnique relativement au tronçon 2 du Parc Forillon. Les travaux ont été menés en accord avec les termes de référence de notre proposition de services professionnels envoyée par courriel en date du 13 avril 2014.

Cette étude de reconnaissance des sols organiques a pour but de déterminer la nature et quelques propriétés des matériaux de surface à l'emplacement du tronçon 2 projeté et de formuler des commentaires et recommandations d'ordre géotechnique nécessaires à la conception de la future route.

Ce rapport contient une description du projet et du site, des explications sur les méthodes de reconnaissance utilisées sur le terrain et en laboratoire, une description de la nature et des propriétés des matériaux rencontrés, des informations relativement aux conditions d'eau souterraine et nos recommandations applicables.

La portée de l'étude est précisée à l'annexe 1. Celle-ci s'avère importante pour une bonne compréhension des informations contenues dans le rapport et doit être considérée comme faisant partie intégrante de celui-ci. Les annexes du rapport contiennent également le journal des sondages, un reportage photographique ainsi que divers plans (plan de situation et plan de localisation).

2 DESCRIPTION DU PROJET ET DU SITE

2.1 DESCRIPTION DU PROJET

Parcs Canada projette de construire une nouvelle route qui reliera la route du secteur Nord avec le boulevard du Cap-de-Rosiers dans les limites du Parc Forillon. Le tronçon 2 étudié dans le cadre de ce rapport couvre une distance de l'ordre de 1,5 km et couvre les chaînages 302+500 à 304+000. Ce tronçon sera en remblai et il est projeté d'utiliser les matériaux de déblais provenant des travaux de réfection du tronçon 1 pour ériger le remblai. Nous vous référons au plan de situation placé en annexe.

2.2 DESCRIPTION DU SITE

Le tronçon 2 étudié passe à travers une zone pouvant contenir des formations organiques (tourbières). On définit une formation organique comme un dépôt s'étant formé au fil des siècles par l'accumulation et la décomposition, dans un milieu mal drainé, de débris de végétation muscinale, herbacée, arbustive ou arborescente. Lorsque les sols organiques sont partiellement décomposés on les appelle «terre organique noire» ou «tourbe» selon leurs caractéristiques.

Le tronçon 2 recoupe également deux (2) cours d'eau qui nécessiteront la mise en place d'un pont (qui ne fait pas l'objet du présent rapport) entre les chaînages approximatif 302+800 à 303+000.

La route débute au chaînage 302+500 selon une orientation nord-est sur une longueur de l'ordre de 700 m pour devenir en direction nord sur le reste du tronçon. Nous vous référons au plan de localisation placé en annexe.

3 MÉTHODES DE RECONNAISSANCE

La détermination de la nature et des propriétés des matériaux a été réalisée à partir de travaux sur le terrain et en laboratoire.

3.1 TRAVAUX SUR LE TERRAIN

Les travaux sur le terrain ont été effectués les 25 et 26 juin 2014. Ils ont consisté en la localisation et la réalisation de cent quatre (104) sondages à la tarière manuelle et seize (16) essais scissométriques. Leur emplacement est montré sur le plan de localisation inclus à l'annexe 4.

3.1.1 Tarière manuelle

Cette technique est surtout employée lors de reconnaissance préliminaire ou sur des dépôts organiques afin de ne pas endommager leur structure. Une tarière est fixée à un train de tiges et le fonçage est assuré par une rotation manuelle (voir photographies 2, 3 et 4 en annexe).

Les sondages, identifiés TA-01 à TA-36, ont été réalisés au 40 m le long du tracé projeté du tronçon 2. À chaque chaînage, à l'exception des sondages TA-35 et TA-36 réalisés en dehors de la zone de la présente étude, un sondage a été réalisé au centre ligne (ex : TA-01c) et deux autres sondages à 10 m à droite (ex : TA-01d) et à 10 m à gauche (ex : TA-01g) du centre ligne projeté. Ils ont atteint des profondeurs variant entre 0,10 et 1,15 m sous la surface du terrain actuel soit jusqu'à la couche de dépôt meuble sous-jacente à la couche de surface composée soit de terre végétale ou de terre organique noire (à l'exception du sondage TA-10g où aucune terre n'a été identifiée en surface).

3.1.2 Essais scissométriques

Treize (13) essais scissométriques ont été réalisés à quelques endroits dans les sols organiques au long du tracé étudié dans le cadre de cette étude (pour un total de 16 si on inclut les trois essais fait dans le sondage TA-36 au chaînage 302+900) afin d'évaluer leur résistance au cisaillement. Cette résistance est fonction de la densité de fibres par unité de volume et du degré de décomposition du sol organique. Cet essai a été effectué au moyen d'un scissomètre portatif

Armstrong (64-358A) appartenant au ministère des Transports. L'appareil se compose d'un train de tiges, dont le diamètre est d'environ 16 mm, auquel est fixé, à l'une des extrémités, un croisillon formé de palettes, dont les dimensions sont de 65 mm sur 130 mm, assemblées à angle droit (voir photographie 7 en annexe). Les lectures sont relevées à l'aide d'un torquemètre (clé dynamométrique) dont la graduation va de 0 à 50 lb-pi (0-70 N.m.). Pour transformer les lectures en kiloPascals, le coefficient a été calculé à 1,33 fois la valeur obtenue en livres-pieds.

3.1.3 Arpentage

La localisation des sondages a été effectuée par le personnel de LVM aux endroits projetés. Aucun nivellement n'a été effectué.

3.1.4 Supervision

Les travaux sur le terrain ont été réalisés sous la supervision d'un ingénieur stagiaire. Ce dernier a effectué la localisation et des sondages, dirigé les opérations, identifié les échantillons récupérés, mesuré le niveau de l'eau souterraine, réalisé les essais scissométriques et rédigé les rapports de sondage sur le terrain.

3.2 TRAVAUX DE LABORATOIRE

Les échantillons récupérés dans les sondages ont été acheminés à notre laboratoire. Aucune analyse n'a été réalisée.

Les échantillons seront conservés pendant une période de trois (3) mois à compter de la date de parution de ce rapport. Ils seront par la suite détruits à moins de recevoir des directives spéciales à cet égard de la part d'un représentant autorisé du client.

4 NATURE ET PROPRIÉTÉS DES MATÉRIAUX

On devra se référer au journal de sondages placé à l'annexe 2 pour une description détaillée des matériaux.

4.1 TERRE VÉGÉTALE

De la terre végétale a été identifiée aux chaînages suivants :

- ▶ 302+500 à 302+820 sur une épaisseur variant entre 0,10 et 0,30 m (à l'exception de secteurs sporadiques et non continus longitudinalement et/ou transversalement aux chaînages 302+580, 302+700 et 302+740 où de la terre organique a été rencontrée variant entre 0,10 et 0,35 m d'épaisseur);
- ▶ 303+160 à 303+240 sur une épaisseur variant entre 0,15 et 0,20 m;
- ▶ 303+600 à 303+720 sur une épaisseur variant entre 0,00 et 0,30 m.

4.2 SOLS ORGANIQUES

De la terre organique noire, classifiée H5 selon l'échelle de Von Post, a été identifiée le long du tronçon étudié dans ce rapport, donc sans tenir compte des sondages TA-35 et TA-36, aux chaînages suivants :

- ▶ 303+000 à 303+120 sur une épaisseur variant entre 0,20 et 0,50 m (à l'exception d'un secteur sporadique et non continu longitudinalement et/ou transversalement au chaînage 303+040 où de la terre végétale a été rencontrée sur 0,13 m d'épaisseur)
- ▶ 303+280 à 303+560 sur une épaisseur variant entre 0,10 et 1,10 m (à l'exception de secteurs sporadiques et non continus longitudinalement et/ou transversalement aux chaînages 303+440 et 303+480 où de la terre végétale a été rencontrée sur 0,20 m d'épaisseur);
- ▶ 303+760 à 304+000 sur une épaisseur variant entre 0,18 et 0,52 m.

4.3 DÉPÔTS MEUBLES

Sous la terre végétale ou la terre organique noire et exceptionnellement directement en surface au chaînage 303+640 côté gauche, les dépôts meubles ont été identifiés. Il s'agit essentiellement de matériaux granulaires de type :

- ▶ Silt, proportion variable de sable, traces à un peu de gravier (localement graveleux)
- ▶ Sable, proportion variable de silt, traces à un peu de gravier (localement graveleux)
- ▶ Gravier silteux, traces de sable (seulement au chaînage 303+600 côté droit)
- ▶ Sable et gravier à graveleux et silteux (seulement au chaînage 303+720)
- ▶ Présence en traces d'argile ou d'argile silteuse (seulement aux chaînages 303+800 à 303+840)

Toutefois, il s'agit que d'un aperçu de la nature des sols sous-jacents à la couche de surface et leur épaisseur et compacité (ou consistance) n'ont pas été mesurées. Localement, un refus sur cailloux a été obtenu et aucun matériau meuble n'a pu être identifié.

5 EAU SOUTERRAINE

Le niveau de l'eau souterraine a été observé lors de la réalisation des sondages. Les résultats représentent toutefois une condition à court terme compte tenu de la durée des observations sur le terrain. À noter que le niveau de l'eau souterraine n'est pas statique mais peut varier selon les précipitations, les saisons et les modifications apportées à l'environnement. Les résultats sont indiqués sur le journal de sondages inséré à l'annexe 2.

6 COMMENTAIRES ET RECOMMANDATIONS

Les commentaires et recommandations présentés dans les paragraphes suivants sont basés sur les résultats des travaux sur le terrain.

6.1 CONSTANCE ET ÉPAISSEUR DE LA TERRE ORGANIQUE

Les travaux de reconnaissance réalisés le long du tronçon 2 ont permis d'identifier des zones où de la terre organique a été rencontrée alors qu'ailleurs, il y a présence que d'un simple couvert végétale.

Du chaînage 302+500 jusqu'au futur pont, seuls de petits emplacements sporadiques contiennent une faible épaisseur (0,10 m) de terre organique noire. À partir du chaînage 303+000, trois (3) secteurs contenant de la terre organique noire ont été localisés.

Secteur 1 : Le premier secteur, d'une longueur de l'ordre de 120 m, soit entre les chaînages 303+000 à 303+120, contient de la terre organique sur une épaisseur variant entre 0,20 et 0,50 m pour une moyenne de l'ordre de 0,30 m.

Secteur 2 : Le deuxième secteur, d'une longueur de l'ordre de 280 m, soit entre les chaînages 303+280 à 303+560, contient de la terre organique sur une épaisseur variant entre 0,10 et 1,10 m pour une moyenne de l'ordre de 0,45 m. C'est dans ce secteur, plus particulièrement autour du chaînage 303+320 (sondage TA-18) que la terre organique est la plus épaisse (jusqu'à 1,10 m) et, sur les photographies aériennes (ou sur le plan de localisation) on note la présence de cicatrices de cours d'eau.

Secteur 3 : Finalement, le troisième secteur, d'une longueur de l'ordre de 240 m, soit entre les chaînages 303+760 à 304+000, contient de la terre organique sur une épaisseur variant entre 0,18 et 0,52 m pour une moyenne de l'ordre de 0,35 m.

6.2 RÉSISTANCE AU CISAILLEMENT

La résistance au cisaillement non drainée de la terre organique noire a été mesurée à treize (13) reprises au long du tracé étudié dans le cadre de cette étude. Les résultats sont compilés dans le tableau 1.

Tableau 1 Résistance au cisaillement non drainée des sols organiques

| SECTEUR | SONDAGE | CHAÎNAGE | POSITION | PROFONDEUR (m) | RÉSULTATS (kPa) |
|---------------|---------|--------------|--------------|----------------|-----------------|
| Avant le pont | TA-32 | 302+740 | Centre ligne | 0,30 | 9 |
| 1 | TA-25 | 303+040 | Gauche | 0,30 | 12 |
| | TA-23 | 303+120 | Centre ligne | 0,25 | 20 |
| 2 | TA-19 | 303+280 | Centre ligne | 0,30 | 8 |
| | TA-18 | 303+320 | Gauche | 0,30 | 9 |
| | | | | 0,80 | 25 |
| | | | | 1,00 | 33 |
| | TA-16 | 303+400 | Centre ligne | 0,25 | 11 |
| | TA-14 | 303+480 | Centre ligne | 0,25 | 16 |
| TA-12 | 303+560 | Centre ligne | 0,25 | 17 | |
| 3 | TA-06 | 303+800 | Centre ligne | 0,30 | 16 |
| | TA-04 | 303+880 | Centre ligne | 0,40 | 8 |
| | TA-02 | 303+960 | Centre ligne | 0,30 | 8 |

En conclusion, le secteur 1 contient un sol organique avec une valeur de résistance au cisaillement variant entre 12 et 20 kPa (résistance au cisaillement non drainée peu élevée). Le secteur 2 contient un sol organique avec une valeur de résistance au cisaillement variant entre 8 et 33 kPa (résistance au cisaillement non drainée peu élevée à élevée) où la plus petite valeur est près de la surface alors que les valeurs les plus grandes sont plus en profondeur (dans le secteur le plus épais). Finalement, le secteur 3 contient un sol organique avec une valeur de résistance au cisaillement variant entre 8 et 16 kPa (résistance au cisaillement non drainée peu à moyennement élevée).

6.3 MÉTHODE DE CONSTRUCTION

Compte tenu de la faible épaisseur, en général, et de la dispersion par secteur des sols organiques ainsi qu'étant donné le type de route, la méthode de construction par remblai traditionnel peut être utilisée. Il est toutefois recommandé que le profil final du futur revêtement soit à une hauteur minimale de 1,2 m au-dessus de la surface du terrain naturel initial.

Cette méthode consiste à construire le remblai de façon traditionnelle, sans tenir compte de la couche organique. Cette méthode de consolidation sans surcharge ne nécessite aucun programme d'instrumentation.

Nous recommandons de placer une première couche de 900 mm d'épaisseur. Idéalement, nous recommandons de mettre en place les matériaux de déblai du tronçon 1 les plus drainants dans cette première couche. Par la suite, le remblai peut être complété de la même façon qu'un remblai construit au-dessus d'un sol minéral ferme.

6.4 CALCUL DE TASSEMENTS

Les calculs des tassements générés par les remblais construits sur des sols organiques permet d'estimer les quantités additionnelles de matériaux requises pour atteindre le profil fixé. Quant au sol meuble sous-jacent, ils sont de nature généralement granulaire. Par conséquent les tassements dans ces matériaux se feront au fur et à mesure de la construction du remblai.

L'épaisseur totale de matériaux requise pour atteindre le niveau désiré pour le profil projeté est donnée par la formule suivante :

$$R_t = H_r \times 100 / (100 - T)$$

Où R_t : hauteur du remblai à construire

H_r : hauteur prévue au-dessus de la surface du terrain naturel pour atteindre le niveau fixé

T : pourcentage de tassement prévu selon la courbe (figure 2 du *Guide pour l'étude et la construction de remblais routiers sur tourbières*, MTQ, septembre 2012)

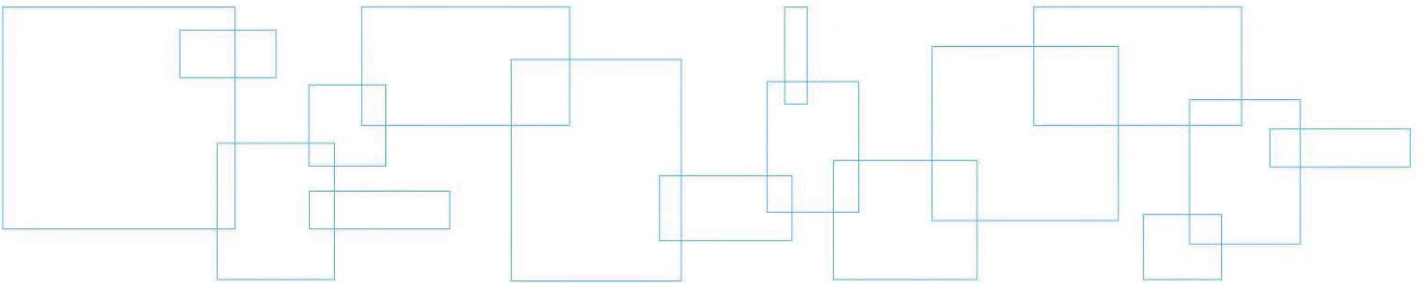
Dans notre cas le H_r est égal à 1200 mm et le T est égal à 10 % pour une épaisseur de couche organique inférieure à 0,5 m et à 18 % pour une épaisseur de couche organique de l'ordre de 1,0 m d'épaisseur.

Conséquemment, le tassement généré dans les sols organiques par la construction du remblai projeté est égal à moins de 130 mm (1330 mm (tassement total) – 1200 mm (hauteur du remblai projeté)) là où l'épaisseur de la couche organique n'excède pas 0,5 m et de l'ordre de 260 mm (1460 mm (tassement total) – 1200 mm (hauteur du remblai projeté)) là où l'épaisseur de la couche organique est de l'ordre de 1,0 m d'épaisseur (secteur du chaînage 303+320).

6.5 ANALYSE DE STABILITÉ

Étant donné la faible épaisseur des sols organiques, de leur résistance au cisaillement non drainée, de la nature des sols sous-jacents, de la hauteur du remblai projeté ainsi que le fait que le remblai sera posé en 2 temps (couche initiale puis reste du remblai), nous avons calculé que ceux-ci peuvent supporter le remblai projeté sans risque de rupture. Nous recommandons toutefois l'utilisation de pentes de remblai de 1V : 2H durant toute la période de construction.

Annexe 1 Portée 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 LVM 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 LVM.

4.0 *Suivi du projet*

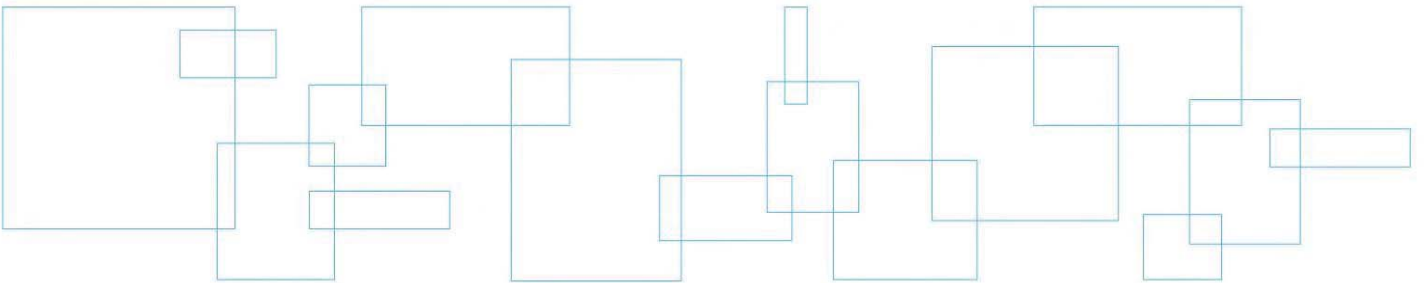
L'interprétation des résultats de chantier et de laboratoire et les recommandations présentées dans ce rapport s'appliquent uniquement au site étudié et aux informations disponibles sur le projet au moment de la rédaction du rapport.

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, LVM 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, LVM 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 Journal de sondage



Journal des sondages et résultats d'analyses

Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet: P-0006391-0-01-100
 Mandat:

Types de sondages
 1- Sondage manuel
 2- Forage mécanique
 3- Forage au diamant
 4- Puit d'exploration

Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
 Date: 3 juillet 2014

| Chaînage | Localisation en mètre | | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | | MD % | LA % | W % | Lim. Consist. L.L. % I.P. % | Niv. d'eau' C.U. | Remarques | |
|----------|-----------------------|----|---|----------------|------|----------------------|---------------|------------------|--------------|--|--------------------|------|------|------|------|-----|-----------------------------|------------------|-----------|------|
| | G | CL | D | de | à | | | | | | 5 | 1,25 | 0,32 | | | | | | | 0,08 |
| 302+500 | 10,0 | | | 0,00 | 0,10 | 0,10 | TA-26g | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Silt, un peu de sable, traces de gravier | | | | | | | | | | |
| 302+500 | | X | | 0,00 | 0,10 | 0,10 | TA-26c | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Silt, un peu de sable, traces de gravier | | | | | | | | | | |
| 302+500 | | | | 10,0 | 0,00 | 0,15 | TA-26d | | | Terre végétale | | | | | | | | | | |
| | | | | | | 0,15 | | | | Sable silteux, traces de gravier | | | | | | | | | | |
| 302+540 | 10,0 | | | 0,00 | 0,10 | 0,10 | TA-27g | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Sable silteux, traces de graver | | | | | | | | | | |
| 302+540 | | X | | 0,00 | 0,10 | 0,10 | TA-27c | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Silt, un peu de sable, traces de gravier | | | | | | | | | | |
| 302+540 | | | | 10,0 | 0,00 | 0,15 | TA-27d | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | |
| 302+580 | 10,0 | | | 0,00 | 0,25 | 0,25 | TA-28g | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | |
| 302+580 | | X | | 0,00 | 0,10 | 0,10 | TA-28c | | | Terre organique noire | | | | | | | | | | |
| | | | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | |
| 302+580 | | | | 10,0 | 0,00 | 0,10 | TA-28d | | | Terre organique noire | | | | | | | | | | |
| | | | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | |
| 302+620 | 10,0 | | | 0,00 | 0,10 | 0,10 | TA-29g | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | |
| 302+620 | | X | | 0,00 | 0,10 | 0,10 | TA-29c | | | Terre végétale | | | | | | | | | | |
| | | | | | | | | | | Sable et silt, traces de gravier | | | | | | | | | | |

Note : N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

Journal des sondages et résultats d'analyses

Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
 Date: 3 juillet 2014

Types de sondages
 1- Sondage manuel
 2- Forage mécanique
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Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet: P-0006391-0-01-100
 Mandat: N/Dossier:

| Localisation en mètre | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | | MD % | LA % | W % | Lim. Consist. L.L. % I.P. % | Niv. d'eau' \bar{x} | C.U. | Remarques | |
|-----------------------|------|----------------|------|----------------------|---------------|------------------|--------------|-------------------------------------|-----------------------|---|------|------|------|-----|-----------------------------|-----------------------|------|-----------|------|
| G | CL | D | de | | | | | | à | 5 | 1,25 | | | | | | | | 0,32 |
| 302+620 | | 10,0 | 0,00 | 0,10 | 0,10 | TA-29d | | Terre végétale | | | | | | | | | | | |
| | | | | | | | | Silt sableux, traces de gravier | | | | | | | | | | | |
| 302+660 | 10,0 | | 0,00 | 0,12 | 0,12 | TA-30g | | Terre végétale | | | | | | | | | | | |
| | | | | | | | | Silt et sable, traces de gravier | | | | | | | | | | | |
| 302+660 | | x | 0,00 | 0,15 | 0,15 | TA-30c | | Terre végétale | | | | | | | | | | | |
| | | | | | | | | Sable, un peu de silt et de gravier | | | | | | | | | | | |
| 302+660 | | | 10,0 | 0,00 | 0,15 | 0,15 | TA-30d | | Terre végétale | | | | | | | | | | |
| | | | | | | | | Sable, un peu de silt et de gravier | | | | | | | | | | | |
| 302+700 | 10,0 | | 0,00 | 0,10 | 0,10 | TA-31c | | Terre végétale | | | | | | | | | | | |
| | | | | | | | | Silt graveleux et sableux | | | | | | | | | | | |
| 302+700 | | x | 0,00 | 0,20 | 0,20 | TA-31c | | Terre végétale | | | | | | | | | | | |
| | | | | | | | | Sable, traces de silt et de gravier | | | | | | | | | | | |
| 302+700 | | | 10,0 | 0,00 | 0,20 | 0,20 | TA-31d | | Terre organique noire | | | | | | | | | | |
| | | | | | | | | Sable, traces de silt et de gravier | | | | | | | | | | | |
| 302+740 | 10,0 | | 0,00 | 0,25 | 0,25 | TA-32g | | Terre végétale | | | | | | | | | | | |
| | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | | |
| 302+740 | | x | 0,00 | 0,35 | 0,35 | TA-32c | | Terre organique noire | | | | | | | | | | | |
| | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | | |
| 302+740 | | | 10,0 | 0,00 | 0,25 | 0,25 | TA-32d | | Terre végétale | | | | | | | | | | |
| | | | | | | | | Sable silteux, traces de gravier | | | | | | | | | | | |
| 302+780 | 10,0 | | 0,00 | 0,30 | 0,30 | TA-33g | | Terre végétale | | | | | | | | | | | |
| | | | | | | | | Silt et sable, traces de gravier | | | | | | | | | | | |

Note: N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

Journal des sondages et résultats d'analyses

Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
 Date : 3 juillet 2014

Types de sondages
 1- Sondage manuel
 2- Forage mécanique
 3- Forage au diamant
 4- Puit d'exploration

Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet : P-0006391-0-01-100
 Mandat :
 N/Dossier :

| Localisation en mètre | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | MD % | LA % | W % | Lim. Consist. L.L. % I.P. % | Niv. d'eau' C.U. | Remarques |
|-----------------------|------|----------------|------|----------------------|---------------|------------------|--------------|----------------------------------|--------------------|---|------|------|-----|-----------------------------|------------------|-----------------------------------|
| G | CL | D | de | | | | | | à | 5 | | | | | | |
| 302+780 | x | | 0,00 | 0,30 | TA-33c | | | Terre végétale | | | | | | | 0,30 | |
| | | | 0,30 | | | | | Sable silteux, un peu de gravier | | | | | | | | |
| 302+780 | | 10,0 | 0,00 | 0,30 | TA-33d | | | Terre végétale | | | | | | | N.R. | |
| | | | 0,30 | | | | | Silt et sable, traces de gravier | | | | | | | | |
| 302+820 | 10,0 | | 0,00 | 0,30 | TA-34g | | | Terre végétale | | | | | | | N.R. | |
| | | | 0,30 | | | | | Sable silteux, un peu de gravier | | | | | | | | |
| 302+820 | x | | 0,00 | 0,30 | TA-34c | | | Terre végétale | | | | | | | N.R. | |
| | | | 0,30 | | | | | Sable silteux, un peu de gravier | | | | | | | | |
| 302+820 | | 10,0 | 0,00 | 0,30 | TA-34d | | | Terre végétale | | | | | | | N.R. | |
| | | | 0,30 | | | | | Sable silteux, un peu de gravier | | | | | | | | |
| 302+860 | x | | 0,00 | 0,35 | TA-35c | | | Terre organique noire | | | | | | | 0,10 | |
| | | | 0,35 | | | | | Sable silteux, traces de gravier | | | | | | | | |
| 302+900 | x | | 0,00 | 1,15 | TA-36c | | | Terre organique noire | | | | | | | 0,05 | R.C.: 0,30m:16 kPa et 1,0m:20 kPa |
| | | | 1,15 | | | | | Argile silteuse | | | | | | | | |
| 303+040 | 10,0 | | 0,00 | 0,38 | TA-25g | | | Terre organique noire | | | | | | | N.R. | R.C.: 0,30m:12 kPa |
| | | | 0,38 | | | | | Sable et silt, traces de gravier | | | | | | | | |
| 303+040 | x | | 0,00 | 0,31 | TA-25c | | | Terre végétale | | | | | | | N.R. | |
| | | | 0,31 | | | | | Sable et silt, traces de gravier | | | | | | | | |
| 303+040 | | 10,0 | 0,00 | 0,38 | TA-25d | | | Terre organique noire | | | | | | | N.R. | |
| | | | 0,38 | | | | | Sable et silt, traces de gravier | | | | | | | | |
| 303+080 | 10,0 | | 0,00 | 0,40 | TA-24g | | | Terre organique noire | | | | | | | 0,20 | |
| | | | 0,40 | | | | | Sable et silt, un peu de gravier | | | | | | | | |

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Journal des sondages et résultats d'analyses

Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet : P-0006391-0-01-100
 Mandat :

Types de sondages
 1- Sondage manuel
 2- Forage mécanique
 3- Forage au diamant
 4- Puit d'exploration

Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
 Date : 3 juillet 2014

| Chaînage | Localisation en mètre | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | MD % | LA % | W % | Lim. Consist. L.L. % I.P. % | Niv. d'eau' C.U. | Remarques |
|----------|-----------------------|----|----------------|------|----------------------|---------------|------------------|--------------|---|--------------------|---|------|------|-----|-----------------------------|------------------|--------------------|
| | G | CL | D | de | | | | | | à | 5 | | | | | | |
| 303+080 | | | | 0,00 | 0,50 | 0,50 | TA-24c | | Terre organique noire | | | | | | | 0,20 | |
| | | | | 0,50 | | | | | Sable et silt, un peu de gravier | | | | | | | | |
| 303+080 | | | 10,0 | 0,00 | 0,30 | 0,30 | TA-24d | | Terre organique noire | | | | | | | 0,20 | |
| | | | | 0,30 | | | | | Sable et silt, un peu de gravier | | | | | | | | |
| 303+120 | | | 10,0 | 0,00 | 0,23 | 0,23 | TA-23g | | Terre organique noire | | | | | | | 0,00 | |
| | | | | 0,23 | | | | | Silt et sable, traces de gravier | | | | | | | | |
| 303+120 | | | | 0,00 | 0,27 | 0,27 | TA-23c | | Terre organique noire | | | | | | | 0,10 | R.C.: 0,25m:20 kPa |
| | | | | 0,27 | | | | | Silt et sable, un peu de gravier | | | | | | | | |
| 303+120 | | | 10,0 | 0,00 | 0,20 | 0,20 | TA-23d | | Terre organique noire | | | | | | | 0,05 | |
| | | | | 0,20 | | | | | Silt sableux, traces de gravier | | | | | | | | |
| 303+160 | | | 10,0 | 0,00 | 0,15 | 0,15 | TA-22g | | Terre végétale | | | | | | | 0,15 | |
| | | | | 0,15 | | | | | Sable et silt, un peu de gravier | | | | | | | | |
| 303+160 | | | | 0,00 | 0,15 | 0,15 | TA-22c | | Terre végétale | | | | | | | 0,15 | |
| | | | | 0,15 | | | | | Sable et silt, un peu de gravier | | | | | | | | |
| 303+160 | | | 10,0 | 0,00 | 0,15 | 0,15 | TA-22d | | Terre végétale | | | | | | | 0,15 | |
| | | | | 0,15 | | | | | Sable et silt, un peu de gravier | | | | | | | | |
| 303+200 | | | 10,0 | 0,00 | 0,15 | 0,15 | TA-21g | | Terre végétale | | | | | | | 0,15 | |
| | | | | 0,15 | | | | | Sable et silt, un peu de gravier | | | | | | | | |
| 303+200 | | | | 0,00 | 0,15 | 0,15 | TA-21c | | Terre végétale | | | | | | | 0,15 | |
| | | | | 0,15 | | | | | Sable et silt, un peu de gravier | | | | | | | | |
| 303+200 | | | 10,0 | 0,00 | 0,20 | 0,20 | TA-21d | | Terre végétale | | | | | | | N.R. | |
| | | | | 0,20 | | | | | Silt, un peu de gravier, traces de silt | | | | | | | | |

Note : N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

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Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
 Date : 3 juillet 2014

Types de sondages
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Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Fontlon
 Municipalité Gaspé, Québec
 N° de projet : P-0006391-0-01-100
 Mandat :
 N/Dossier :

| Chaînage | Localisation en mètre | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | | MD % | LA % | W % | Lim. Consist. L.L. % / I.P. % | Niv. d'eau' C.U. | Remarques |
|----------|-----------------------|----|----------------|------|----------------------|---------------|------------------|--------------|----------------------------------|--------------------|---|------|------|------|-----|-------------------------------|------------------|---|
| | G | CL | D | de | | | | | | à | 5 | 1,25 | | | | | | |
| 303+240 | 10,0 | | | 0,00 | 0,15 | 0,15 | TA-20g | | Terre végétale | | | | | | | | 0,15 | |
| | | | | | | | | | Sable et silt, un peu de gravier | | | | | | | | | |
| 303+240 | | x | | 0,00 | 0,15 | 0,15 | TA-20c | | Terre végétale | | | | | | | | 0,15 | |
| | | | | 0,15 | | | | | Sable et silt, un peu de gravier | | | | | | | | | |
| 303+240 | | | 10,0 | 0,00 | 0,15 | 0,15 | TA-20d | | Terre végétale | | | | | | | | 0,15 | |
| | | | | 0,15 | | | | | Sable et silt, un peu de gravier | | | | | | | | | |
| 303+280 | 10,0 | | | 0,00 | 0,50 | 0,50 | TA-19g | | Terre organique noire | | | | | | | | 0,10 | |
| | | | | 0,50 | | | | | Silt et sable, traces de gravier | | | | | | | | | |
| 303+280 | | x | | 0,00 | 0,55 | 0,55 | TA-19c | | Terre organique noire | | | | | | | | 0,10 | R.C.: 0,30m:3 kPa |
| | | | | 0,55 | | | | | Silt et sable, traces de gravier | | | | | | | | | |
| 303+280 | | | 10,0 | 0,00 | 0,50 | 0,50 | TA-19d | | Terre organique noire | | | | | | | | 0,10 | |
| | | | | 0,50 | | | | | Silt et sable, traces de gravier | | | | | | | | | |
| 303+320 | 10,0 | | | 0,00 | 1,05 | 1,05 | TA-18g | | Terre organique noire | | | | | | | | 0,00 | R.C.: 0,30m:9 kPa, 0,80m :25 kPa et 1,0m:33 kPa |
| | | | | 1,05 | | | | | Sable et silt, traces de gravier | | | | | | | | | |
| 303+320 | | x | | 0,00 | 0,90 | 0,90 | TA-18c | | Terre organique noire | | | | | | | | 0,00 | |
| | | | | 0,90 | | | | | Sable et silt, traces de gravier | | | | | | | | | |
| 303+320 | | | 10,0 | 0,00 | 1,10 | 1,10 | TA-18d | | Terre organique noire | | | | | | | | 0,00 | |
| | | | | 1,10 | | | | | Sable et silt, traces de gravier | | | | | | | | | |
| 303+360 | 10,0 | | | 0,00 | 0,50 | 0,50 | TA-17g | | Terre organique noire | | | | | | | | 0,05 | |
| | | | | 0,50 | | | | | Silt et sable, traces de gravier | | | | | | | | | |
| 303+360 | | x | | 0,00 | 0,41 | 0,41 | TA-17c | | Terre organique noire | | | | | | | | 0,10 | |
| | | | | 0,41 | | | | | Silt et sable, traces de gravier | | | | | | | | | |

Note : N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

Journal des sondages et résultats d'analyses

Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
 Date : 3 juillet 2014

Types de sondages
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 2- Forage mécanique
 3- Forage au diamant
 4- Puit d'exploration

Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet : P-0006391-0-01-100
 Mandat :
 N/Dossier :

| Chaînage | Localisation en mètre | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | MD % | LA % | W % | Lim. Consist. | | Niv. d'eau | C.U. | Remarques | |
|----------|-----------------------|----|----------------|------|----------------------|---------------|------------------|--------------|---|--------------------|---|------|------|-----|---------------|------|------------|------|-----------|--------------------|
| | G | CL | D | | | | | | | de | à | | | | 5 | 1,25 | | | | 0,32 |
| 303+360 | | | 10,0 | 0,00 | 0,40 | 0,40 | TA-17d | | Terre organique noire | | | | | | | | 0,05 | | | |
| | | | | | | 0,40 | | | Sable et silt, traces de gravier | | | | | | | | | | | |
| 303+400 | 10,0 | | | 0,00 | 0,35 | 0,35 | TA-16g | | Terre organique noire | | | | | | | | 0,20 | | | |
| | | | | | | 0,35 | | | Sable et silt, un peu de gravier | | | | | | | | | | | |
| 303+400 | | x | | 0,00 | 0,25 | 0,25 | TA-16c | | Terre organique noire | | | | | | | | 0,20 | | | R.C.: 0,25m:11 kPa |
| | | | | | | 0,25 | | | Sable et silt, un peu de gravier | | | | | | | | | | | |
| 303+400 | | | 10,0 | 0,00 | 0,38 | 0,38 | TA-16d | | Terre organique noire | | | | | | | | 0,20 | | | |
| | | | | | | 0,38 | | | Silt sableux, traces de gravier | | | | | | | | | | | |
| 303+440 | 10,0 | | | 0,00 | 0,20 | 0,20 | TA-15g | | Terre organique noire | | | | | | | | 0,20 | | | |
| | | | | | | 0,20 | | | Silt sableux, traces de gravier | | | | | | | | | | | |
| 303+440 | | x | | 0,00 | 0,20 | 0,20 | TA-15c | | Terre végétale | | | | | | | | 0,20 | | | |
| | | | | | | 0,20 | | | Sable et silt, un peu de gravier | | | | | | | | | | | |
| 303+440 | | | 10,0 | 0,00 | 0,10 | 0,10 | TA-15d | | Terre organique noire | | | | | | | | N.R. | | | |
| | | | | | | 0,10 | | | Refus sur cailloux | | | | | | | | | | | |
| 303+480 | 10,0 | | | 0,00 | 0,42 | 0,42 | TA-14g | | Terre organique noire | | | | | | | | N.R. | | | |
| | | | | | | 0,42 | | | Silt sableux, traces de gravier et d'argile | | | | | | | | | | | |
| 303+480 | | x | | 0,00 | 0,30 | 0,30 | TA-14c | | Terre organique noire | | | | | | | | N.R. | | | R.C.: 0,25m:16 kPa |
| | | | | | | 0,30 | | | Silt, un peu de sable et de gravier | | | | | | | | | | | |
| 303+480 | | | 10,0 | 0,00 | 0,20 | 0,20 | TA-14d | | Terre végétale | | | | | | | | N.R. | | | |
| | | | | | | 0,20 | | | Silt et sable, traces de gravier | | | | | | | | | | | |
| 303+520 | | x | | 0,00 | 0,28 | 0,28 | TA-13g | | Terre organique noire | | | | | | | | 0,00 | | | |
| | | | | | | 0,20 | | | Sable silteux, un peu de gravier | | | | | | | | | | | |

Note : N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

Journal des sondages et résultats d'analyses

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 Technicien Hugo Faucher
 Date : 3 juillet 2014

Types de sondages
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Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet : P-0006391-0-01-100
 Mandat :

N/Dossier :

| Chaînage | Localisation en mètre | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | | MD % | LA % | W % | Lim. Consist. | | C.U. | Remarques | |
|----------|-----------------------|----|----------------|------|----------------------|---------------|------------------|--------------|--|--------------------|---|------|------|------|-----|---------------|-------|------|-----------|--------------------|
| | G | CL | D | de | | | | | | à | 5 | 1,25 | | | | 0,32 | 0,080 | | | 2 µm |
| 303+520 | | X | | 0,00 | 0,30 | 0,30 | TA-13c | | Terre organique noire | | | | | | | | | 0,00 | | |
| | | | | 0,30 | | | | | Sable silteux, un peu de gravier | | | | | | | | | | | |
| 303+520 | | | 10,0 | 0,00 | 0,30 | 0,30 | TA-13d | | Terre organique noire | | | | | | | | | | N.R. | |
| | | | | 0,30 | | | | | Silt, un peu de sable et de gravier | | | | | | | | | | | |
| 303+560 | 10,0 | | | 0,00 | 0,41 | 0,14 | TA-12g | | Terre organique noire | | | | | | | | | | N.R. | |
| | | | | 0,41 | | | | | Silt, un peu de gravier et de sable | | | | | | | | | | | |
| 303+560 | | X | | 0,00 | 0,40 | 0,40 | TA-12c | | Terre organique noire | | | | | | | | | | N.R. | |
| | | | | 0,40 | | | | | Silt, un peu de gravier et de sable | | | | | | | | | | | R.C.: 0,25m:17 kPa |
| 303+560 | | | 10,0 | 0,00 | 0,40 | 0,40 | TA-12d | | Terre organique noire | | | | | | | | | | N.R. | |
| | | | | 0,40 | | | | | Refus sur cailloux | | | | | | | | | | | |
| 303+600 | 10,0 | | | 0,00 | 0,18 | 0,18 | TA-11g | | Terre végétale | | | | | | | | | | N.R. | |
| | | | | 0,18 | | | | | Silt, un peu de gravier, traces de sable | | | | | | | | | | | |
| 303+600 | | X | | 0,00 | 0,20 | 0,20 | TA-11c | | Terre végétale | | | | | | | | | | N.R. | |
| | | | | 0,20 | | | | | Silt sableux, traces à un peu de gravier | | | | | | | | | | | |
| 303+600 | | | 10,0 | 0,00 | 0,38 | 0,38 | TA-11d | | Terre végétale | | | | | | | | | | 0,38 | |
| | | | | 0,38 | | | | | Gravier silteux, traces de sable | | | | | | | | | | | |
| 303+640 | 10,0 | | | 0,00 | 0,00 | 0,00 | TA-10g | | Terre végétale | | | | | | | | | | N.R. | |
| | | | | 0,00 | | | | | Silt, un peu de sable, traces de gravier | | | | | | | | | | | |
| 303+640 | | X | | 0,00 | 0,20 | 0,20 | TA-10c | | Terre végétale | | | | | | | | | | N.R. | |
| | | | | 0,20 | | | | | Silt graveleux, un peu de sable | | | | | | | | | | | |
| 303+640 | | | 10,0 | 0,00 | 0,20 | 0,20 | TA-10d | | Terre végétale | | | | | | | | | | 0,15 | |
| | | | | 0,20 | | | | | Sable et silt graveleux | | | | | | | | | | | |

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Journal des sondages et résultats d'analyses

Période de réalisation des sondages : _____
 Technicien : Hugo Faucher
 Date : 3 juillet 2014

Types de sondages
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Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet : P-0006391-D-01-100
 Mandat : _____
 N/Dossier : _____

| Chainage | Localisation en mètre | | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | MD % | LA % | W % | Lim. Consist. | | Niv. d'eau | C.U. | Remarques | | | |
|----------|-----------------------|----|---|----------------|------|----------------------|---------------|------------------|--------------|--|--------------------|------|------|------|-----|---------------|-------|------------|------|-----------|--------------------|--------|--------|
| | G | CL | D | de | à | | | | | | 5 | 1,25 | | | | 0,32 | 0,080 | | | | 2 µm | L.L. % | I.P. % |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 303+680 | 10,0 | | | 0,00 | 0,20 | 0,20 | TA-09g | | | Terre végétale | | | | | | | | N.R. | | | | | |
| | | | | | 0,20 | | | | | Silt sableux et graveleux | | | | | | | | | | | | | |
| 303+680 | | x | | 0,00 | 0,13 | 0,13 | TA-09c | | | Terre végétale | | | | | | | | N.R. | | | | | |
| | | | | 0,13 | | | | | | Silt, un peu de sable, traces de gravier | | | | | | | | | | | | | |
| 303+680 | | | | 10,0 | 0,00 | 0,13 | TA-09d | | | Terre végétale | | | | | | | | N.R. | | | | | |
| | | | | | 0,13 | | | | | Silt, un peu de sable, traces de gravier | | | | | | | | | | | | | |
| 303+720 | 10,0 | | | 0,00 | 0,15 | 0,15 | TA-08g | | | Terre végétale | | | | | | | | N.R. | | | | | |
| | | | | | 0,15 | | | | | Sable et gravier silteux | | | | | | | | | | | | | |
| 303+720 | | x | | 0,00 | 0,15 | 0,15 | TA-08c | | | Terre végétale | | | | | | | | N.R. | | | | | |
| | | | | | 0,15 | | | | | Sable et gravier silteux | | | | | | | | | | | | | |
| 303+720 | | | | 10,0 | 0,00 | 0,10 | TA-08d | | | Terre végétale | | | | | | | | N.R. | | | | | |
| | | | | | 0,10 | | | | | Sable et gravier silteux | | | | | | | | | | | | | |
| 303+760 | 10,0 | | | 0,00 | 0,36 | 0,36 | TA-07g | | | Terre organique noire | | | | | | | | N.R. | | | | | |
| | | | | | 0,36 | | | | | Sable silteux et graveleux | | | | | | | | | | | | | |
| 303+760 | | x | | 0,00 | 0,30 | 0,30 | TA-07c | | | Terre organique noire | | | | | | | | 0,30 | | | | | |
| | | | | | 0,30 | | | | | Sable silteux, un peu de gravier | | | | | | | | | | | | | |
| 303+760 | | | | 10,0 | 0,00 | 0,34 | TA-07d | | | Terre organique noire | | | | | | | | 0,30 | | | | | |
| | | | | | 0,34 | | | | | Sable et silt, un peu de gravier | | | | | | | | | | | | | |
| 303+800 | 10,0 | | | 0,00 | 0,40 | 0,40 | TA-06g | | | Terre organique noire | | | | | | | | 0,00 | | | | | |
| | | | | | 0,40 | | | | | Silt, un peu de sable, traces d'argile et de gravier | | | | | | | | | | | | | |
| 303+800 | | x | | 0,00 | 0,40 | 0,40 | TA-06c | | | Terre organique noire | | | | | | | | 0,00 | | | R.C.: 0,30m:16 kPa | | |
| | | | | | 0,40 | | | | | Silt, un peu de sable, traces d'argile et de gravier | | | | | | | | | | | | | |

Note : N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

Journal des sondages et résultats d'analyses

Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
 Date 3 juillet 2014

Types de sondages
 1- Sondage manuel
 2- Forage mécanique
 3- Forage au diamant
 4- Puit d'exploration

Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet: P-0006391-0-01-100
 Mandat:

N/Dossier :

| Chaînage | Localisation en mètre | | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | | MD % | LA % | W % | Lim. Consist. L.L. % I.P. % | Niv. d'eau' C.U. | Remarques | |
|----------|-----------------------|----|------|----------------|------|----------------------|---------------|------------------|--------------|---|--------------------|------|------|------|------|-----|-----------------------------|------------------|-----------|------------------|
| | G | CL | D | de | à | | | | | | 5 | 1,25 | 0,32 | | | | | | | 0,080/2 µm |
| | | | | | | | | | | | | | | | | | | | | |
| 303+800 | | | 10,0 | 0,00 | 0,52 | 0,52 | TA-06d | | | Terre organique noire | | | | | | | | 0,32 | | |
| | | | | | 0,52 | | | | | Sable et silt, un peu de gravier | | | | | | | | | | |
| 303+840 | 10,0 | | | 0,00 | 0,30 | 0,30 | TA-05g | | | Terre organique noire | | | | | | | | | N.R. | |
| | | | | 0,30 | | | | | | Argile silteux, traces de sable | | | | | | | | | | |
| 303+840 | | x | | 0,00 | 0,32 | 0,32 | TA-05c | | | Terre organique noire | | | | | | | | | N.R. | |
| | | | | 0,32 | | | | | | Silt, un peu de sable, traces de gravier | | | | | | | | | | |
| 303+840 | | | 10,0 | 0,00 | 0,20 | 0,20 | TA-05d | | | Terre organique noire | | | | | | | | | N.R. | |
| | | | | 0,20 | | | | | | Silt sableux, un peu de gravier | | | | | | | | | | |
| 303+880 | 10,0 | | | 0,00 | 0,46 | 0,46 | TA-04g | | | Terre organique noire | | | | | | | | | 0,15 | |
| | | | | 0,46 | | | | | | Sable et silt, traces de gravier | | | | | | | | | | |
| 303+880 | | x | | 0,00 | 0,40 | 0,40 | TA-04c | | | Terre organique noire | | | | | | | | | 0,25 | R.C.: 0,40m8 kPa |
| | | | | 0,40 | | | | | | Sable, un peu de silt et de gravier | | | | | | | | | | |
| 303+880 | | | 10,0 | 0,00 | 0,30 | 0,30 | TA-04d | | | Terre organique noire | | | | | | | | | 0,30 | |
| | | | | 0,30 | | | | | | Sable et silt, traces de gravier | | | | | | | | | | |
| 303+920 | 10,0 | | | 0,00 | 0,18 | 0,18 | TA-03g | | | Terre organique noire | | | | | | | | | 0,20 | |
| | | | | 0,18 | | | | | | Sable, un peu de silt et de gravier | | | | | | | | | | |
| 303+920 | | x | | 0,00 | 0,40 | 0,40 | TA-03c | | | Terre organique noire | | | | | | | | | 0,40 | |
| | | | | 0,40 | | | | | | Sable et silt, traces à un peu de gravier | | | | | | | | | | |
| 303+920 | | | 10,0 | 0,00 | 0,40 | 0,40 | TA-03d | | | Terre organique noire | | | | | | | | | 0,20 | |
| | | | | 0,40 | | | | | | Silt sableux, un peu de gravier | | | | | | | | | | |
| 303+960 | 10,0 | | | 0,00 | 0,25 | 0,25 | TA-02g | | | Terre organique noire | | | | | | | | | 0,05 | |
| | | | | 0,25 | | | | | | Silt et sable, traces de gravier | | | | | | | | | | |

Note : N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

Journal des sondages et résultats d'analyses

Période de réalisation des sondages 25 et 26 juin 2014
 Technicien Hugo Faucher
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Types de sondages
 1- Sondage manuel
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Projet: Reconnaissance des sols organiques
 Tronçon 2 - Parc Forillon
 Municipalité Gaspé, Québec
 N° de projet : P-0006391-0-01-100
 Mandat :
 N/Dossier :

| Chaînage | Localisation en mètre | | Profondeur (m) | | Épaisseur couche (m) | N° de sondage | N° d'échantillon | N° d'analyse | Description | Granulométrie (mm) | | | MD % | LA % | W % | Lim. Consist. | | Niv. d'eau ¹ | C.U. | Remarques | | | |
|----------|-----------------------|----|----------------|------|----------------------|---------------|------------------|--------------|---|--------------------|---|------|------|------|-----|---------------|-------|-------------------------|------|-------------------|------|--------|--------|
| | G | CL | D | de | | | | | | à | 5 | 1,25 | | | | 0,32 | 0,060 | | | | 2 µm | L.L. % | I.P. % |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 303+960 | x | | | 0,00 | 0,42 | 0,42 | TA-02c | | Terre organique noire | | | | | | | | | 0,00 | | R.C.: 0,30m:8 kPa | | | |
| | | | | 0,42 | | | | | Sable et silt, traces à un peu de gravier | | | | | | | | | | | | | | |
| 303+960 | | | 10,0 | 0,00 | 0,48 | 0,48 | TA-02d | | Terre organique noire | | | | | | | | | 0,20 | | | | | |
| | | | | 0,48 | | | | | Sable silteux, traces de gravier | | | | | | | | | | | | | | |
| 304+000 | | | 10,0 | 0,00 | 0,40 | 0,40 | TA-01g | | Terre organique noire | | | | | | | | | 0,40 | | | | | |
| | | | | 0,40 | | | | | Silt, traces de sable et de gravier | | | | | | | | | | | | | | |
| 304+000 | x | | | 0,00 | 0,43 | 0,43 | TA-01c | | Terre organique noire | | | | | | | | | 0,43 | | | | | |
| | | | | 0,43 | | | | | Sable silteux, traces de gravier | | | | | | | | | | | | | | |
| 304+000 | | | 10,0 | 0,00 | 0,45 | 0,45 | TA-01d | | Terre organique noire | | | | | | | | | 0,45 | | | | | |
| | | | | 0,45 | | | | | Sable silteux, traces de gravier | | | | | | | | | | | | | | |

Note : N.R.: non rencontré N.M.: non mesuré N.P.: non plastique R.C.: Résistance au cisaillement de la terre organique

Annexe 3 Reportage photographique

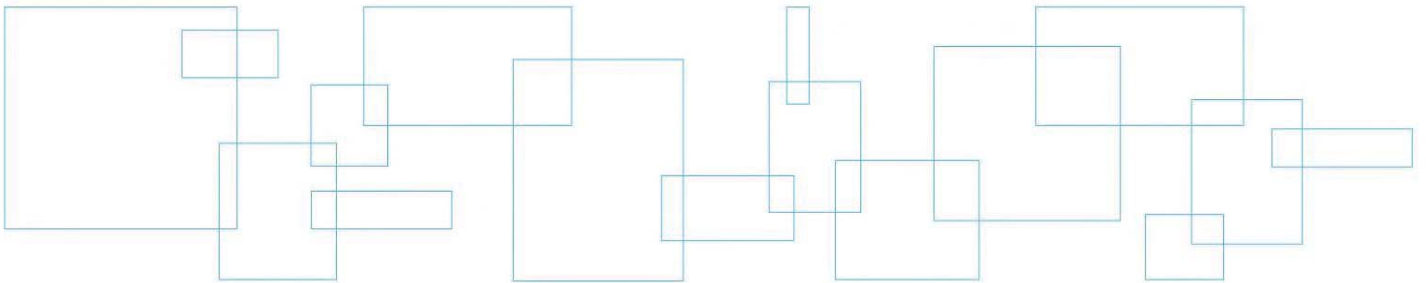




Photo 1 : Vue vers l'est du tronçon projeté #2. Chaînage 302+500. Sondage TA-26.



Photo 2 : Vue vers l'est du tronçon projeté #2. Chaînage 302+660. Sondage TA-30.



Photo 3 : Vue vers le sud-ouest du tronçon projeté #2. Chaînage 303+040. Sondage TA-25.



Photo 4 : Vue vers le sud-ouest du tronçon projeté #2. Chaînage 303+120. Sondage TA-23.



Photo 5 : Vue vers le sud-ouest du tronçon projeté #2. Chaînage 303+240. Sondage TA-20.



Photo 6 : Vue vers le sud-ouest du tronçon projeté #2. Chaînage 303+320. Sondage TA-18.



Photo 7 : Vue vers le sud-ouest du tronçon projeté #2. Chaînage 303+360. Sondage TA-17.



Photo 8 : Vue vers le sud du tronçon projeté #2. Chaînage 303+520. Sondage TA-13.



Photo 9 : Vue vers le sud du tronçon projeté #2. Chaînage 303+600. Sondage TA-11.



Photo 10 : Vue vers le sud du tronçon projeté #2. Chaînage 303+720. Sondage TA-8.

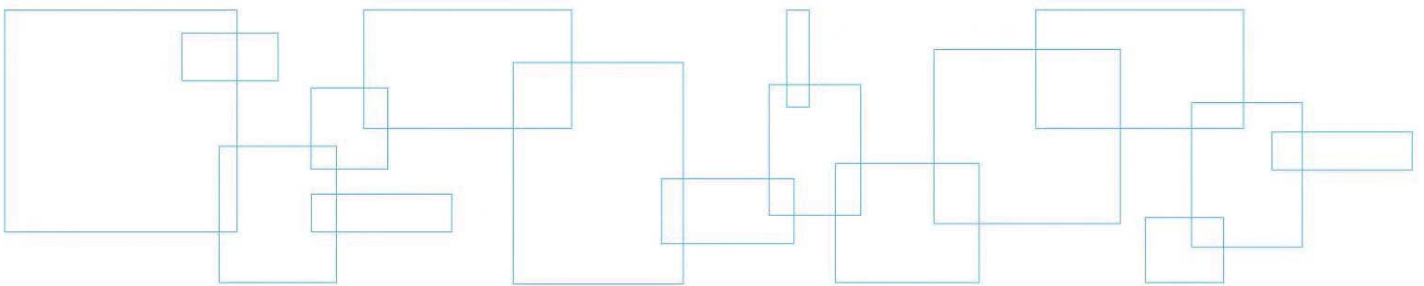


Photo 11 : Vue vers le sud du tronçon projeté #2. Chaînage 304+000. Sondage TA-1.

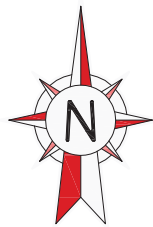


Photo 12 : Échantillon représentatif de la terre organique noire.

Annexe 4 Plans de situation et de localisation



10 cm



5

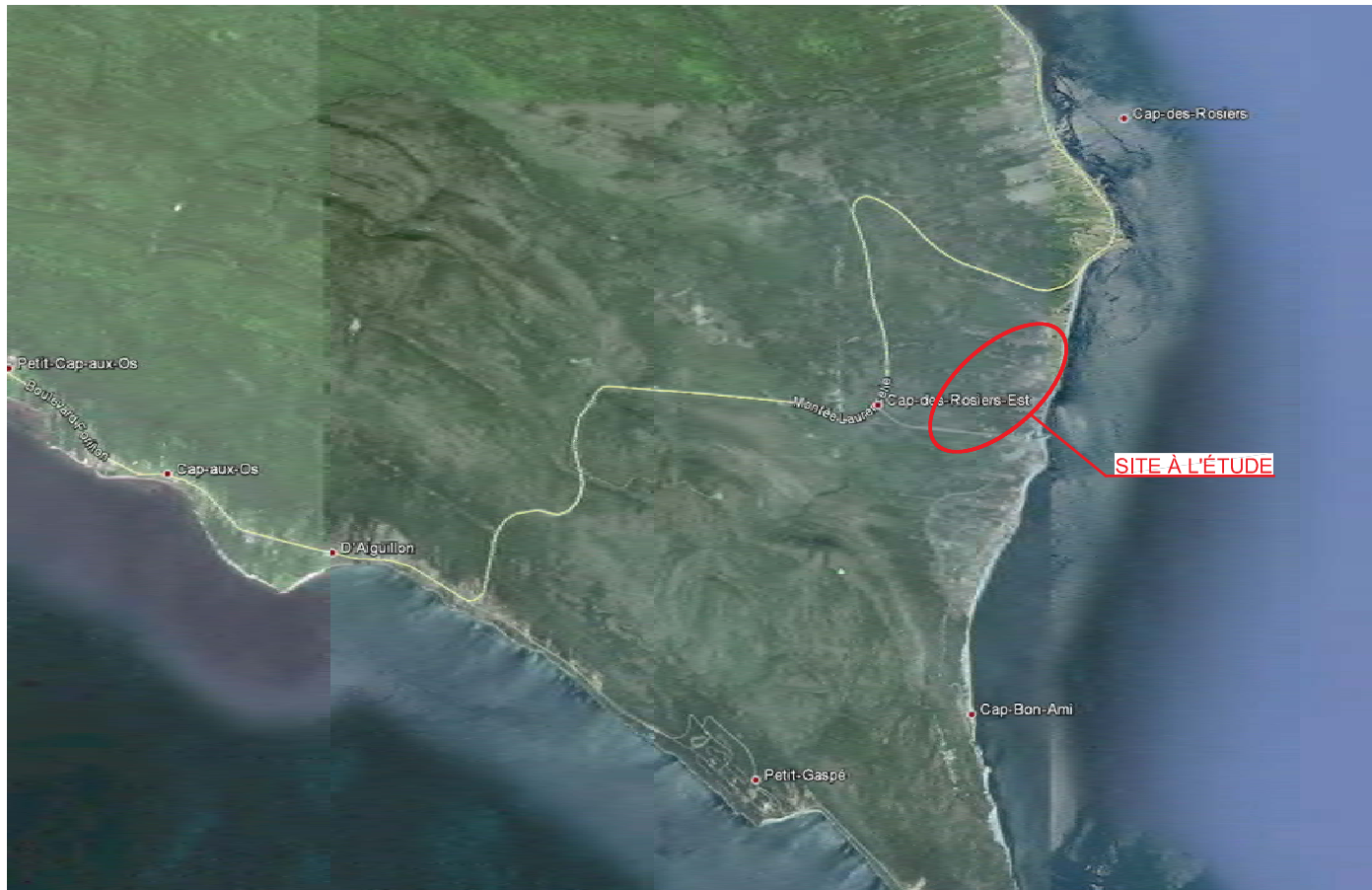
4

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Source: Photographie aérienne extraite de Google Earth, Image©2014 DigitalGlobe.

Ce document doit être utilisé conjointement avec les recommandations formulées dans le rapport d'étude géotechnique

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Client
DESSAU

Projet
**RECONNAISSANCE DES SOLS ORGANIQUES
ÉTUDE GÉOTECHNIQUE
TRONÇON 2**
PARC FORILLON, QC

Titre
PLAN DE SITUATION



LVM inc.

331, rue Rivard
Rimouski (Québec) G5L 7J6
Téléphone : 418.723.1144
Télécopieur : 418.722.4691

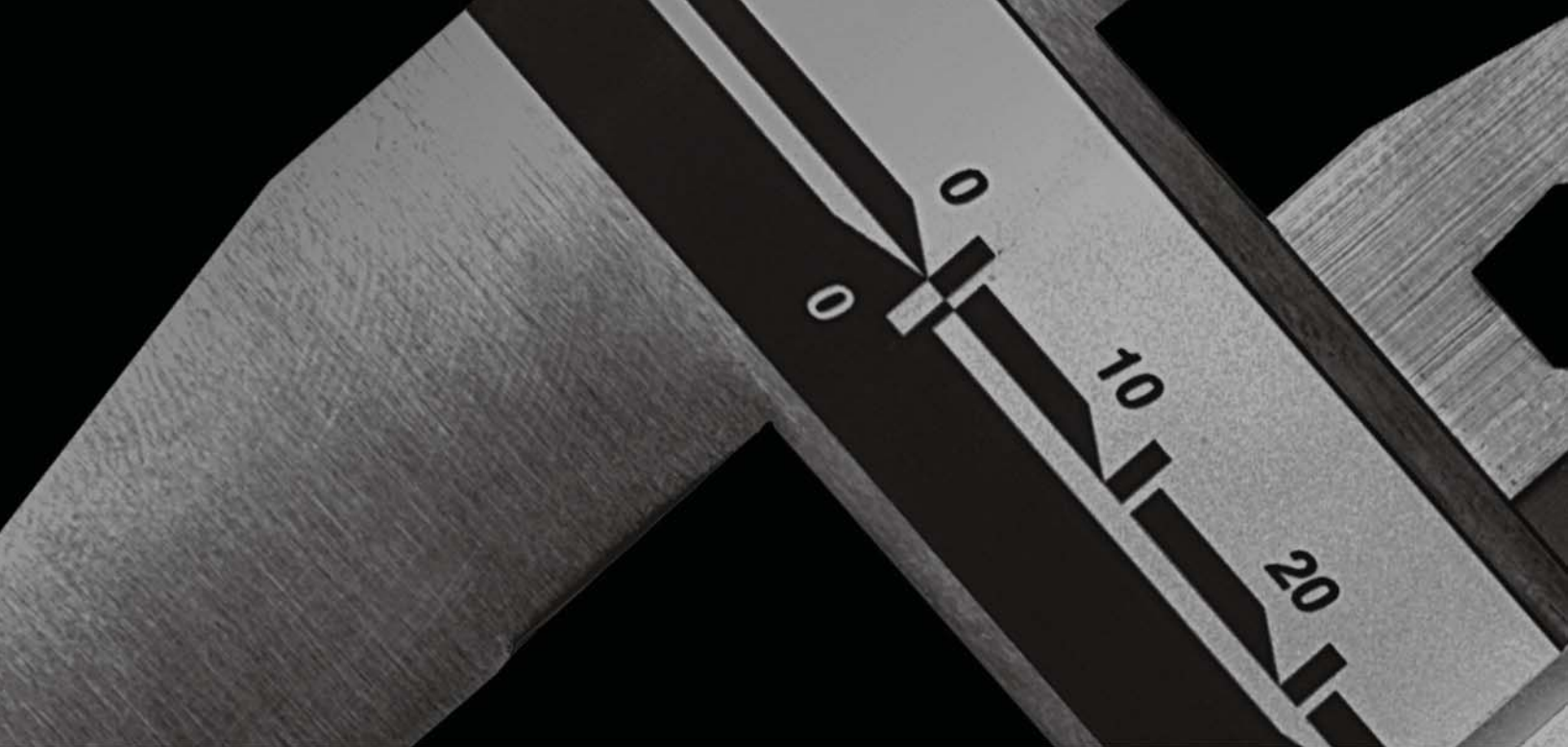
Préparé **H. Charrois, Geo.**
Dessiné **M.P. Côté**
Vérifié **N. Huard, ing.**

Discipline **Géotechnique**
Échelle **1 : 75 000**
Date **2014-07-07**

Chargé de projet
N. Huard, ing.
Révision date :

| Serv. resp. | Projet | Otp | Disc. | Type | N° Dessin | Rév. |
|-------------|------------------|------------|------------|-------------|-------------|-----------|
| 073 | P-0006391 | 001 | 100 | GE D | 0001 | 00 |





RAPPORT : Q025238-A1

PARCS CANADA
Étude géotechnique – Pont ruisseau Cap-des-Rosiers
Réfection majeure de la route 132 au parc national Forillon – phase II
Gaspé (Québec)



4 février 2015



Rimouski, le 4 février 2015

Monsieur Frédéric Sainte-Croix, ing.
Gestion des biens / Unité de gestion de la Gaspésie
Parcs Canada
122, boul. Gaspé
Gaspé (Québec) G4X 1A9

Objet : Étude géotechnique – Pont ruisseau Cap-des-Rosiers
Réfection majeure de la route 132 au parc national Forillon – phase II
Gaspé (Québec)
Notre numéro de projet : Q025238-A1

Monsieur Sainte-Croix,

C'est avec plaisir que nous vous transmettons notre rapport relativement à la réalisation de l'étude géotechnique réalisée au site mentionné en rubrique.

Nous vous remercions d'avoir retenu les services techniques et professionnels d'Inspec-Sol et nous espérons avoir le privilège de vous servir à nouveau dans le futur.

Notre objectif sera toujours de vous offrir un service à la mesure de vos attentes!

N'hésitez pas à communiquer avec nous pour tout renseignement complémentaire en composant le (418) 724-7030.

Veillez croire, Monsieur Sainte-Croix, à l'expression de nos sentiments les meilleurs.

INSPEC-SOL INC.



Guy Dionne, ing., M.Sc.
Vice-président

GD/jl

PARCS CANADA



**Étude géotechnique – Pont ruisseau Caps-des-Rosiers
Réfection majeure de la route 132
au parc national Forillon – phase II
Gaspé (Québec)**

PARCS CANADA
122, boul. Gaspé
Gaspé (Québec) G4X 1A9

Étude géotechnique – Pont ruisseau Cap-des-Rosiers
Réfection majeure de la route 132 au parc national Forillon – phase II
Gaspé (Québec)

N/Réf. : Q025238-A1
4 février 2015

Préparé par :

 
Guy Dionne, ing., M.Sc.

Distribution : Parcs Canada – M. Frédéric Sainte-Croix, ing.
(Par courriel : fred.sainte-croix@pc.gc.ca et poste)

Le respect de l'environnement et la préservation de nos ressources naturelles sont des priorités pour Inspec-Sol inc. Dans cette perspective, nous imprimons nos documents recto-verso sur un papier 50 % recyclé.

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Annexe 1 Localisation des forages (dessin no Q025238-A1-9)

Annexe 2 Rapports de forages

Annexe 3 Photographies

1.0 Introduction

Les services professionnels d'Inspec-Sol inc. (**Inspec-Sol**) ont été retenus par Parcs Canada, afin de réaliser une étude géotechnique à l'emplacement d'un futur pont prévu enjambrer le ruisseau Cap-des-Rosiers. Le site en question est localisé dans le tracé de la future route 132 (phase II) dans le parc Forillon, à Gaspé, Québec.

Cette étude avait pour objectif de déterminer la nature et les caractéristiques des sols et du roc en place, afin de présenter des recommandations géotechniques relativement à la conception et à la construction du nouvel ouvrage.

Le présent rapport rend compte de l'ensemble de nos travaux de terrain effectués, fait état des résultats obtenus puis établit des recommandations géotechniques quant à la construction du nouveau pont. Ce rapport est accompagné de trois (3) annexes contenant les éléments suivants :

- ◆ Annexe 1 : localisation des forages (dessin no Q025238-A1-9) ;
- ◆ Annexe 2 : rapports des forages, et;
- ◆ Annexe 3 : photographies.

Le présent rapport a été réalisé conformément au « Code canadien sur le calcul des ponts routiers, CAN/CSA-S6-06 ».

2.0 Méthodologie

Essentiellement, les travaux de terrain ont consisté en la réalisation de deux (2) forages stratigraphiques dont l'un sur la rive est (F-1-1) et l'autre sur la rive ouest du ruisseau (F-1-2). Les emplacements des forages réalisés sont montrés au dessin no Q025238-A1-9 de l'annexe 1. Soulignons que les forages ont été effectués le plus près possible du ruisseau, considérant la présence d'une forte pente entre la position des forages et le ruisseau lui-même. Les coordonnées en X et Y des forages sont indiquées sur les rapports de forages.

Le programme de travail (nombre, localisation et profondeur des forages) a été déterminé par le client en collaboration avec **Inspec-Sol**.

Les forages ont été réalisés au moyen d'une foreuse à tarière évidée de marque « CME-55s », montée sur un chenillard. La foreuse utilisée nous a permis de récupérer des échantillons de sol de façon régulière en utilisant un carottier fendu standard de calibre « B ». Lors des prélèvements, des valeurs d'indice « N » de l'essai de pénétration standard ont été mesurées conformément à la norme BNQ-2501-140. Cet indice correspond au nombre de coups requis pour faire pénétrer la cuillère de 300 mm lorsque battue à l'aide d'un marteau pesant 63,5 kg et tombant en chute libre d'une hauteur de 760 mm. Les indices « N » mesurés sont présentés sur les rapports de forages.

Le socle rocheux a été carotté au moyen d'un carottier diamanté de calibre « NQ ».

À la fin des forages, un tube ouvert a été installé à l'intérieur de tous les forages afin de mesurer le niveau de l'eau dans le sol.

Les échantillons de sol et de roc prélevés dans les forages ont été apportés à notre laboratoire pour un examen visuel plus approfondi par un géotechnicien. Ces échantillons seront conservés pendant une période d'un an après l'émission de ce rapport, après quoi nous en disposerons, à moins d'avis contraire de votre part.

Les coordonnées GPS ainsi que les élévations indiquées dans ce rapport sont en mètres et font référence au système géodésique. Les coordonnées en X et Y ont été relevés au moyen d'un GPS de marque « Garmin, modèle 62S ».

Les élévations de la surface du sol indiquées sur les rapports de forages ont été relevées à partir du repère d'arpentage no 850, situé dans ce secteur. Selon les informations fournies, ce point correspond à une élévation géodésique de 6,695 m.

Les travaux de chantier ont été réalisés les 12 et 13 janvier 2015, sous la supervision constante d'un membre de notre personnel technique.

3.0 Description sommaire des sols et du roc

Les forages effectués dans le cadre de ce mandat ont révélé des conditions de sol et de roc similaires. Le tableau no 1 suivant fait la synthèse des unités stratigraphiques rencontrées au droit des forages.

Tableau no 1
Synthèse stratigraphique – Profondeur (m)

| Forage no | Élévation surface | Terre noire | Sable silteux | Socle rocheux |
|-----------------------|-------------------|-------------|---------------|---------------|
| | (m) | Prof. (m) | Prof. (m) | Prof. (m) |
| F-1-1 (rive est) | 6,32 | --- | 0,00 – 1,96 | 1,96 – 5,18 |
| F-1-2 (rive ouest) | 2,19 | 0,00 – 1,68 | 1,68 – 2,74 | 2,74 – 6,10 |

Une description sommaire de chacune des couches est présentée aux sections suivantes.

3.1 Terre noire

Une couche de terre noire a été observée uniquement à l'emplacement du forage F-1-2 et cette couche mesure 1,68 m d'épaisseur.

Des morceaux de bois sont présents en profondeur.

3.2 Sable silteux

Directement en surface (forage F-1-1) ou sous la couche de terre noire (forage F-1-2), on note la présence d'un dépôt de sable silteux brun à gris, avec des traces à un peu de gravier.

La compacité du dépôt varie de très lâche à lâche, avec des indices « N » variant de 2 à 9.

3.3 Socle rocheux

Sous le mort-terrain (remblai et sols naturels), on retrouve le socle rocheux qui a pu être carotté aux emplacements des deux (2) forages. Ce dernier a été rencontré aux élévations 4,36 m et -0,56 m aux emplacements des forages F-1-1 et F-1-2, respectivement.

Le socle rocheux correspond à un mudstone gris-verdâtre. Le roc est de qualité qualifiée de très mauvaise avec des valeurs de « RQD » de 0 %.

Les forages F-1-1 et F-1-2 ont été terminés dans le socle rocheux, à 5,18 m et 6,10 m de profondeur, respectivement.

4.0 Eau souterraine

Les niveaux de la nappe d'eau souterraine ont été relevés le 15 janvier 2015 dans les tubes d'observation installés dans les forages. Le tableau no 2 suivant présente les résultats obtenus.

Tableau no 2
Profondeur de la nappe phréatique – 15 janvier 2015

| Forage | Profondeur (m) | Élévation (m) |
|--------|----------------|---------------|
| F-1-1 | 3,14 | 3,18 |
| F-1-2 | 1,61 | 0,58 |

Le niveau de l'eau dans le sol est cependant susceptible de fluctuer, à la hausse ou à la baisse, selon les saisons et/ou les conditions climatiques et peut donc se retrouver à des profondeurs différentes à d'autres périodes de l'année. Le niveau de l'eau dans le sol doit nécessairement fluctuer en fonction des variations saisonnières du niveau du cours d'eau et possiblement des marées aussi.

5.0 Recommandations et commentaires

Selon les informations transmises, le projet consistera à construire un nouveau pont au-dessus du ruisseau Cap-des-Rosiers.

Au moment de la préparation de ce rapport, les caractéristiques exactes du pont n'étaient pas connues (longueur, largeur, etc.) Les culées du pont seront cependant en béton.

Basés sur les résultats des forages, nos recommandations et commentaires géotechniques pour la construction du nouveau pont sont les suivants :

5.1 Fondations

5.1.1 Résistance géotechnique aux ÉLUL

Considérant les conditions géotechniques rencontrées aux emplacements des forages, il est recommandé que les nouvelles culées reposent sur le roc. Ce dernier a été confirmé aux élévations 4,36 m et -0,56 m aux emplacements des forages F-1-1 et F-1-2, respectivement. Soulignons cependant que les forages ont été réalisés aux endroits accessibles par la foreuse et que ces endroits ne correspondent pas nécessairement aux emplacements prévus des culées. **Nous recommandons de valider les conditions de sol au moyen de tranchées de reconnaissance aux emplacements précis des culées, une fois ceux-ci établis.**

Considérant la qualité du roc en place, la résistance géotechnique aux états limites ultimes (ÉLUL) est évaluée à **1 500 kPa**.

Un coefficient de tenue pondérateur de 0,5 devra être appliqué à cette valeur ÉLUL pour la conception des fondations aux états limites.

La couche de mort-terrain et le roc en place devront être excavés de façon à atteindre la profondeur d'assise des culées. Nous recommandons la mise en place d'un coussin d'assise et de nivellement composé de matériaux de type MG 20 ou MG 56, d'une épaisseur d'environ 200 mm, et ce, immédiatement sous chacune des culées. Ces matériaux devront être compactés à au moins 95 % du Proctor modifié.

Un coussin d'assise de 100 mm d'épaisseur, composé de béton de nivellement, pourrait aussi être considéré dans le cadre de ce projet.

À titre indicatif, les propriétés géotechniques des sols en place sont présentées au tableau no 3 suivant.

Tableau no 3
Propriétés géotechniques des sols

| Propriété | Sable silteux |
|---|------------------------|
| Angle de frottement interne, ϕ' | 30 ° |
| Poids volumique humide, γ_{hum} | 20,5 kN/m ³ |
| Poids volumique saturé, γ_{sat} | 21 kN/m ³ |
| Coefficient de poussée active, K_a | 0,33 |
| Coefficient de poussée passive, K_p | 3,00 |
| Coefficient de poussée des terres au repos, K_0 | 0,50 |

L'angle de frottement à utiliser pour l'interface entre la base des culées et le coussin granulaire (δ') est de 24°. Advenant le cas où les culées reposeraient sur une assise de béton maigre, l'angle de frottement (δ') à utiliser sera alors de 32°.

5.1.2 Réaction géotechnique aux états limites d'utilisation (ÉLUT)

Pour ce projet et assumant que les culées du pont soient préparées selon la méthodologie décrite à la section précédente, nous recommandons d'utiliser une valeur de réaction géotechnique aux ÉLUT de l'ordre de **500 kPa**.

Sous cette contrainte, les tassements des culées seront inférieurs à 25 mm.

5.2 Profondeur de gel

Dans cette région de la Gaspésie, la profondeur de pénétration du gel est estimée à 2,1 m. Considérant que le roc en place est gélif (mudstone), le concepteur devra prévoir l'enfouissement suffisant des culées par rapport au niveau du sol fini afin de les protéger des effets du gel.

5.3 Excavation et stabilité des pentes

Pour ce projet, les excavations seront réalisées non seulement dans le mort-terrain, mais également dans le roc.

Nous sommes d'avis que l'utilisation d'une pelle hydraulique munie d'un marteau hydraulique puissant, possiblement combiné à l'utilisation d'explosifs pourrait être requis afin d'atteindre la profondeur d'assise désirée. La réalisation de forages rapprochés, pourrait aussi être envisagée comme alternative pour l'excavation du roc. **Il est à noter que le roc qualifié de « très mauvaise qualité » indiqué dans les forages ne veut pas nécessairement dire que celui-ci peut être excavé au moyen d'une pelle hydraulique. Ce terme (très mauvaise qualité) indique simplement que les indices « RQD » sont inférieurs à 25 %.**

Compte tenu de la nature des sols et du roc en place, nous recommandons de prévoir les pentes d'excavation suivantes dans les différents matériaux rencontrés, et ce, au-dessus de la nappe phréatique.

- ◆ Dans le sol : pentes minimales de 1,0 V : 1,0 H;
- ◆ Dans le socle rocheux : pentes minimales de 3,0 V : 1,0 H.

La stabilité et la sécurité des pentes demeurent la responsabilité de l'entrepreneur. Celui-ci devra retenir les services d'un laboratoire en sols pour statuer sur la stabilité des parois, si les excavations ont des pentes plus accentuées que celles exigées par la CSST (1,0 V : 1,0 H dans le sol et 3,0 V : 1,0 H dans le roc).

Ces pentes devraient fournir une stabilité satisfaisante à court terme, à condition que les parois soient recouvertes de toiles imperméables pour prévenir l'érosion (dans les sols seulement), si les excavations sont laissées ouvertes plusieurs jours.

Cependant, la présence d'eau souterraine ainsi que les conditions climatiques et la présence de matériaux plus lâches lors des travaux de construction peuvent exiger des pentes plus faibles que celles mentionnées précédemment, afin de maintenir une stabilité adéquate.

Si les pentes mentionnées ci-dessus ne peuvent être réalisées en raison des contraintes géométriques des structures projetées (proximité des bâtiments existants, d'autres conduites, du pavage, etc.), une boîte de tranchée devra alors être mise en place pour assurer la sécurité des travailleurs.

5.4 Contrôle des eaux souterraines

Considérant que les culées du pont prendront appui sur le roc, il sera impossible d'utiliser des palplanches pour assécher la zone de travail. On devra donc prévoir la mise en place de batardeaux construits de sols imperméables, en amont du cours d'eau et du pont, afin de conserver les excavations sèches en tout temps.

Même si de tels batardeaux sont construits, on pourrait s'attendre à de fortes infiltrations en provenance du roc fracturé.

Assumant des batardeaux construits adéquatement, les infiltrations d'eau dans les excavations devraient pouvoir être contrôlées au moyen de pompes ayant un débit suffisant.

5.5 Réutilisation des sols d'excavation

Basé sur les résultats des forages, nous recommandons de ne pas réutiliser les sols d'excavation.

Des matériaux neufs et compactables devront donc être apportés sur le site pour le remblayage des culées.

Le remblayage des culées devra être effectué jusqu'à la ligne d'infrastructure. Le matériau de remblai devra être compacté par couches de 300 mm d'épaisseur à 90 % du Proctor modifié. Les derniers 300 mm sous la ligne d'infrastructure devront être compactés à 95 % du Proctor modifié.

5.6 Potentiel de liquéfaction des sols

Considérant que le roc est présent au niveau d'assise des futures culées, nous sommes d'avis qu'il n'y a aucun risque de liquéfaction des sols lors de forts séismes.

5.7 Inspection de chantier

Il est recommandé de faire inspecter les travaux de fondation par un personnel compétent en géotechnique, qui s'assurera que les culées soient placées sur le coussin d'assise et de nivellement disposé sur le socle rocheux, capable de supporter les pressions de la structure dans des conditions sécuritaires.

Les opérations de remblayage et de compactage des culées devraient également faire l'objet d'un suivi approprié, de façon à s'assurer que des matériaux conformes soient employés et que les degrés de compactage demandés soient effectivement atteints.

6.0 Portée et limitations de l'étude

Ce rapport est destiné uniquement à « Parcs Canada » et aux autres parties explicitement identifiées dans ce rapport et pour qui il a été préparé. Les informations qui y sont contenues sont données au meilleur de notre connaissance et à la lumière des données disponibles à **Inspecc-Sol** au moment de sa rédaction. Le rapport doit être pris comme un tout et doit inclure tous les plans et annexes correspondants : toute utilisation d'une partie séparée du rapport et son interprétation sera la responsabilité de l'utilisateur.

Toute réutilisation ou redistribution non autorisée du rapport à une tierce partie constitue un risque qui incombe uniquement au Client et à son destinataire et pour lequel **Inspecc-Sol** ne peut être tenue responsable. Tout usage du rapport ou d'une partie séparée du rapport que pourrait en faire une tierce partie ou toute décision basée sur son contenu prise par cette tierce partie est la responsabilité de cette dernière. Le Client assumera la responsabilité de défendre, d'indemniser, ainsi que de dégager **Inspecc-Sol** de toute responsabilité résultant de la distribution non autorisée du rapport par le Client.

Les recommandations formulées dans ce rapport sont basées sur notre compréhension actuelle du projet ainsi que sur l'utilisation, la topographie et les conditions actuelles du site, de même que sur la portée du mandat accordé par le Client et décrit dans le rapport. L'étude a été effectuée conformément aux règles et aux méthodes généralement reconnues par les professionnels en géotechnique qui pratiquent dans les mêmes conditions et la même région, et aucune autre interprétation n'est permise. Tout usage que pourrait en faire une tierce partie ou toute décision basée sur son contenu, prise par cette tierce partie, est la responsabilité de cette dernière.

Tous les détails de conception et de construction sont rarement connus à la fin de l'étude géotechnique, et peuvent être modifiés en cours de projet. Les commentaires et recommandations présentés dans le rapport sont basés sur les résultats de notre étude et compréhension du projet tels que définis au moment de l'étude. Les services d'**Inspecc-Sol** devraient être retenus pour revoir ces recommandations et commentaires lorsque les plans et devis seront terminés. Sans cette révision, **Inspecc-Sol** ne pourra être tenue responsable de tout malentendu par rapport aux recommandations ou à l'application et à l'adaptation de celles-ci dans la conception finale.

Il est recommandé que les services d'**Inspecc-Sol** soient retenus durant la construction de toutes les fondations et durant les travaux de terrassement afin de s'assurer que les conditions du sous-sol sont similaires à celles observées durant l'étude et que nos recommandations sont bien comprises à toutes les étapes de construction.

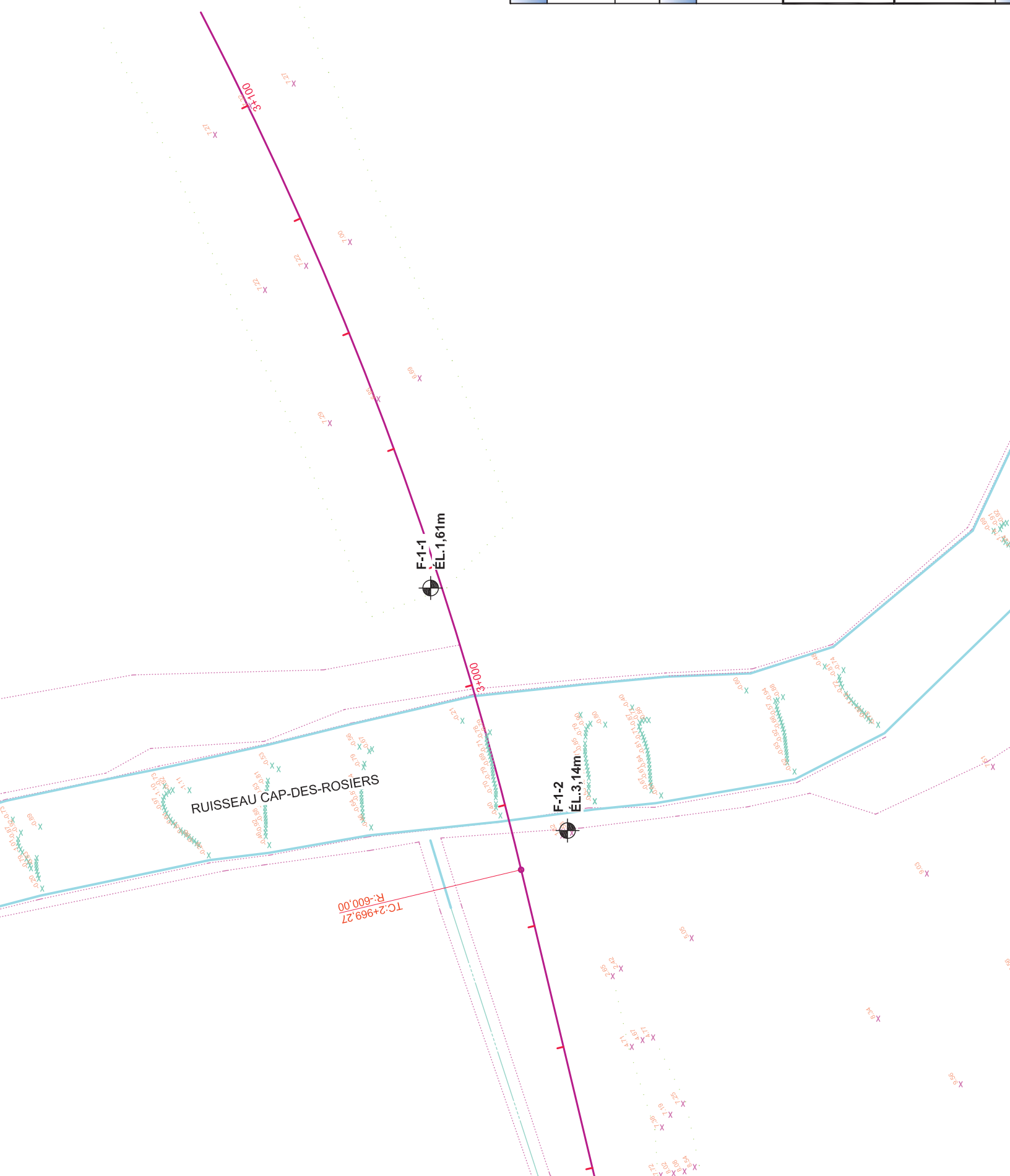
Il est important de souligner qu'une étude géotechnique consiste en un échantillonnage aléatoire et ponctuel d'un site et que les commentaires et recommandations inclus dans ce rapport sont basés sur les résultats obtenus uniquement aux emplacements des sondages (2 forages) réalisés dans le cadre de ce mandat. Les conditions géologiques présentées aux emplacements sondés sont celles qui ont été observées au moment de la réalisation des sondages et peuvent toutefois être modifiées de façon significative par des travaux de construction (excavation, drainage, dynamitage, fonçage de pieux) sur le site ou sur les sites adjacents. Elles peuvent aussi être modifiées par l'exposition des sols et du roc à l'humidité, au séchage ou au gel. Les conditions de sol et d'eau souterraine entre les sondages et au-delà de l'endroit investigué peuvent varier autant en plan qu'en profondeur par rapport aux résultats obtenus à l'emplacement des sondages. De plus, certaines conditions qui n'ont pu être observées ou prévues au moment de l'étude pourraient être rencontrées durant la construction. Dans l'éventualité où les conditions rencontrées sur le site devaient différer de celles observées à l'emplacement des sondages, nous demandons d'être immédiatement avisés par écrit afin de permettre une réévaluation de nos recommandations.

Si des conditions différentes sont identifiées durant la construction, sans égard au degré d'importance des changements, les recommandations émises dans le présent rapport seront considérées comme invalides jusqu'à ce que ces changements soient évalués par **Inspecc-Sol** et que les conclusions du rapport soient modifiées en conséquence ou maintenues par écrit.

GD/jl

Annexe 1

- ◆ Localisation des forages (dessin n° Q025238-A1-9)



Annexe 2

- ◆ Rapports de forages
- ◆ Courbes granulométriques

DESCRIPTION DES SOLS:

Chacune des couches de mort-terrain est décrite selon la terminologie d'usage énumérée ci-après. La compacité des sols granulaires est définie par la valeur de l'indice de pénétration standard "N", et la consistance des sols cohérents par la résistance au cisaillement non drainé à l'état non remanié (Cu).









| CLASSIFICATION (SYSTÈME UNIFIÉ) | | | |
|---------------------------------|-----------------|----------|-----------------|
| Argile | < 0,002mm | | |
| Silt | 0,002 à 0,075mm | | |
| Sable | 0,075 à 4,75mm | fin | 0,075 à 0,425mm |
| | | moyen | 0,425mm à 2,0mm |
| | | grossier | 2,0 à 4,75mm |
| Gravier | 4,75 à 75mm | fin | 4,75mm à 19mm |
| | | grossier | 19 à 75mm |
| Cailloux | 75 à 300mm | | |
| Blocs | > 300mm | | |

| TERMINOLOGIE | |
|-----------------------------|----------|
| "traces" | 1 - 10% |
| "un peu" | 10 - 20% |
| adjectif (silteux, sableux) | 20 - 35% |
| "et" | 35 - 50% |

| COMPACTITÉ DES SOLS GRANULAIRES | INDICE DE PÉNÉTRATION STANDARD "N" (COUPS/PI. - 300mm) |
|---------------------------------|---|
| Très lâche | 0 - 4 |
| Lâche | 4 - 10 |
| Compact | 10 - 30 |
| Dense | 30 - 50 |
| Très dense | > 50 |

| CONSISTANCE DES SOLS COHÉRENTS | RÉSISTANCE AU CISAILLEMENT (Cu) | |
|--------------------------------|---------------------------------|-----------|
| | (lb./pi. ²) | (kPa) |
| Très molle | < 250 | < 12 |
| Molle | 250 - 500 | 12 - 25 |
| Ferme | 500 - 1000 | 25 - 50 |
| Raide | 1000 - 2000 | 50 - 100 |
| Très raide | 2000 - 4000 | 100 - 200 |
| Dure | > 4000 | > 200 |

| INDICE DE QUALITÉ DU ROC | |
|--------------------------|--------------|
| VALEUR "RQD" (%) | QUALIFICATIF |
| < 25 | très mauvais |
| 25 - 50 | mauvais |
| 50 - 75 | moyen |
| 75 - 90 | bon |
| > 90 | excellent |

| SYMBOLES DE LA STRATIGRAPHIE | | | |
|---|---|---|---|
|  |  |  |  |
| sable | gravier | cailloux et blocs | roc (calcaire) |
|  |  |  |  |
| silt | argile | sol organique | remblai |

ÉCHANTILLONS:

TYPE ET NUMÉRO

Le type d'échantillonneur utilisé est défini par l'abréviation indiquée ci-après. La numérotation est continue pour chacun des types.

CF: Cuillère fendue

TM: Tube à paroi mince

TA: Tarière

CFE, VRE, TAE: Échantillonnage environnemental

PS: Tube à piston (Osterberg)

CR: Carottier diamanté

VR: Vrac

RÉCUPÉRATION

La récupération de l'échantillon est le rapport exprimé en pourcentage de la longueur récupérée dans l'échantillonneur à la longueur enfoncée.

RQD

Les indices de qualité du roc ("Rock Quality Designation" ou "RQD") sont définis comme étant le rapport exprimé en pourcentage de la longueur cumulée de tous les fragments de carottes de 4 pouces (10cm) ou plus à la longueur totale de la course.

ESSAIS DE CHANTIER:

N: Indice de pénétration standard

N_C: Indice de pénétration dynamique au cône

k: Perméabilité

R: Refus à l'enfoncement

Cu: Résistance au cisaillement non drainé

ABS: Absorption (eau sous pression)

Pr: Pressiomètre

ESSAIS DE LABORATOIRE:

I_P: Indice de plasticité

H: Sédimentométrie

A: Limites d'Atterberg

C: Consolidation

VO: Vapeur organique

W_L: Limite liquide

AG: Analyse

w: Teneur en eau

CS: Cône Suédois

W_P: Limite plastique

granulométrique

γ: Poids volumique

CHIM: Analyse chimique



RAPPORT DE FORAGE

FORAGE No: F-1-1

| | | | |
|---|---|---|---------------------|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU | |
| PROJET: Étude géotechnique - Pont ruisseau Cap-des-Rosiers - Réfection majeure de la route 132 au parc national Forillon - Phase II | X : 325473.0 Y : 5411375.0 Z : 6.32 | Date : 2015-01-15 Profondeur (m) : 1.61 | |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-9 | |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé | |
| Calibre du carottier : NQ | CF(E) - Cuillère fendue (Environnement) | | ☒ Remanié |
| Type de marteau : Mécanique | CR(E) - Carottier diamanté | | ☒ Intact |
| Rapport d'énergie : | TA(E) - Tarière | | ☐ Forage au diamant |
| Date (début) : 2015-01-13 | TEE - Tube Échantillonnage Environnement | | ■ Perdu |
| Date (fin) : 2014-01-13 | TM - Tube à paroi mince | | |
| | VR(E) - Vrac | | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|----|----|----|----|----|----|----|----|--------------|--------|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | | | |
| 0,0 | 6.32 | | Surface du sol | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | Niveau d'eau | | |
| 1.0 | | | Sol naturel: Sable silteux, traces à un peu de gravier, brun, lâche, humide | ☒ | CF-1 | 50 | | | 1-1-1 1-1 | 2 | | | | | | | | | | | 1.61 m | |
| | | | | ☒ | CF-2 | 47 | | | 2-4-5 6-7 | 9 | | | | | | | | | | | | |
| 2.0 | 1.96 | 4.36 | Socle rocheux: Mudstone, gris à verdâtre, de très mauvaise qualité | ☒ | CF-3 | 50 | | | 10-12 50/13cm | R | | | | | | | | | | | | |
| 3.0 | | | | ☒ | CR-4 | 83 | | | | 0 | | | | | | | | | | | | |
| 4.0 | | | | ☒ | CR-5 | 83 | | | | 0 | | | | | | | | | | | | |
| 5.0 | 5.18 | 1.14 | Fin du forage | | | | | | | | | | | | | | | | | | | |
| 6.0 | | | | | | | | | | | | | | | | | | | | | | |
| 7.0 | | | | | | | | | | | | | | | | | | | | | | |
| 8.0 | | | | | | | | | | | | | | | | | | | | | | |
| 9.0 | | | | | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-1.GPJ INSPECSOL2009.GDT 2-3-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-1-2

| | | | |
|---|---|---|---------------------|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU | |
| PROJET: Étude géotechnique - Pont ruisseau Cap-des-Rosiers - Réfection majeure de la route 132 au parc national Forillon - Phase II | X : 325434.0 Y : 5411353.0 Z : 2.19 | Date : 2015-01-15 Profondeur (m) : 3.14 | |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-9 | |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé | |
| Calibre du carottier : NQ | CF(E) - Cuillère fendue (Environnement) | | ☒ Remanié |
| Type de marteau : Mécanique | CR(E) - Carottier diamanté | | ☒ Intact |
| Rapport d'énergie : | TA(E) - Tarière | | ☐ Forage au diamant |
| Date (début) : 2015-01-12 | TEE - Tube Échantillonnage Environnement | | ■ Perdu |
| Date (fin) : 2015-01-12 | TM - Tube à paroi mince | | |
| | VR(E) - Vrac | | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | | | |
|-----------------------|---------------|---------|---|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|----|----|----|----|----|----|----|----|--------------|-------------|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ W _p W _L ◻ Limites d'Atterberg (%) ◻ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | | | |
| 0,0 | 2.19 | | Surface du sol | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | Niveau d'eau | | |
| | | | Sol naturel: Terre noire, très lâche, présence de morceaux de bois | | CF-1 | 7 | | | 1-1-1 1-1 | 2 | | | | | | | | | | | 3.14 m ▼ | |
| | | | | | CF-2 | 7 | | | 1-1-0 1-1 | 1 | | | | | | | | | | | | |
| 1.68 | 0.51 | | Sable silteux, un peu de gravier, brun à gris, très lâche | | CF-3 | 53 | | | 1-1-1 5-6 | 2 | | | | | | | | | | | | |
| | | | Socle rocheux: Mudstone, gris-verdâtre, de très mauvaise qualité | | CF-4 | 60 | | | 6-8-8-9 50/15cm | 16 | | | | | | | | | | | | |
| 2.74 | -0.55 | | | | CR-5 | 83 | | | | 0 | | | | | | | | | | | | |
| | | | | | CR-6 | 100 | | | | 0 | | | | | | | | | | | | |
| 6.10 | -3.91 | | Fin du forage | | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-1.GPJ INSPECSOL2009.GDT 2-3-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations

Annexe 3

- ◆ Photographies

PARCS CANADA
Étude géotechnique – Pont ruisseau Caps-des-Rosiers
Réfection majeure de la route 132 au parc national Forillon – phase II
Gaspé (Québec)



Photo no 1 : Forage F-1-1

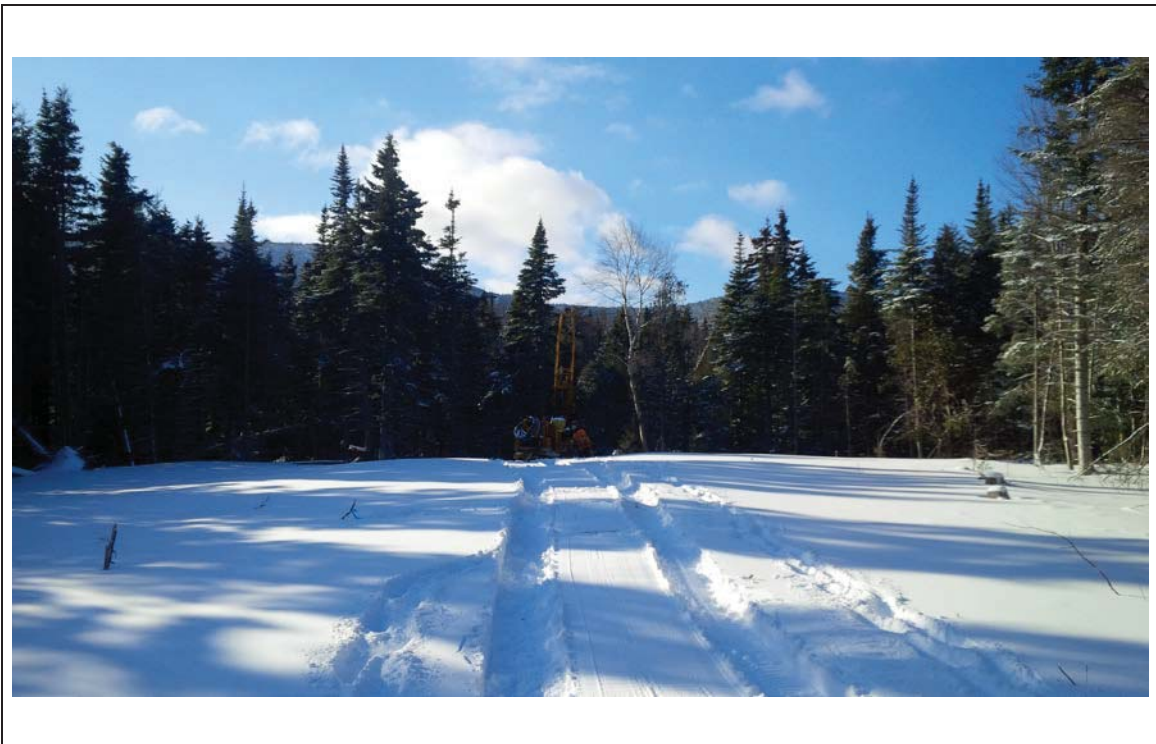


Photo no 2 : Forage F-1-1

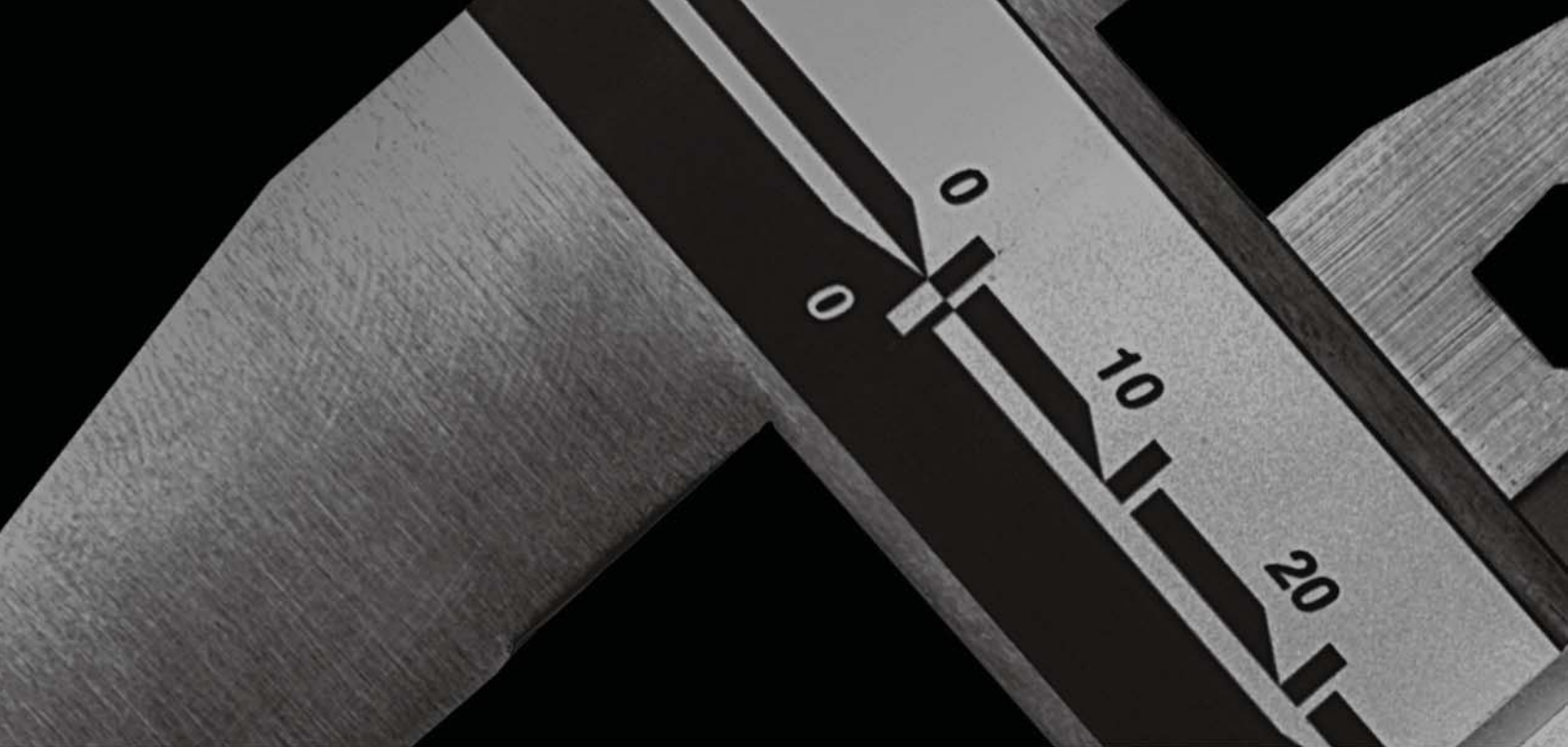
PARCS CANADA
Étude géotechnique – Pont ruisseau Caps-des-Rosiers
Réfection majeure de la route 132 au parc national Forillon – phase II
Gaspé (Québec)



Photo no 3 : Forage F-1-2



Photo no 4 : Forage F-1-2



RAPPORT : Q025238-A1

PARCS CANADA
Étude pédologique
Réfection majeure de la route 132 au parc national Forillon - phase II
Gaspé (Québec)



4 mars 2015



Rimouski, le 4 mars 2015

Monsieur Frédéric Sainte-Croix, ing.
Gestion des biens / Unité de gestion de la Gaspésie
Parcs Canada
122, boul. Gaspé
Gaspé (Québec) G4X 1A9

Objet : Étude pédologique
Réfection majeure de la route 132 au parc national Forillon - phase II
Gaspé (Québec)
Notre numéro de projet : Q025238-A1

Monsieur Sainte-Croix,

C'est avec plaisir que nous vous transmettons notre rapport relativement à la réalisation de l'étude pédologique réalisée au site mentionné en rubrique.

Nous vous remercions d'avoir retenu les services techniques et professionnels d'Inspec-Sol et nous espérons avoir le privilège de vous servir à nouveau dans le futur.

Notre objectif sera toujours de vous offrir un service à la mesure de vos attentes!

N'hésitez pas à communiquer avec nous pour tout renseignement complémentaire en composant le (418) 724-7030.

Veillez croire, Monsieur Sainte-Croix, à l'expression de nos sentiments les meilleurs.

INSPEC-SOL INC.



Guy Dionne, ing., M.Sc.
Vice-président

GD/jl

PARCS CANADA

**Étude pédologique
Réfection majeure de la route 132
au parc national Forillon-phase II
Gaspé (Québec)**

PARCS CANADA
122, boul. Gaspé
Gaspé (Québec) G4X 1A9

Étude pédologique
Réfection majeure de la route 132 au parc national Forillon - phase II
Gaspé (Québec)

N/Réf. : Q025238-A1
4 mars 2015

Préparé par :



Guy Dionne, ing., M.Sc.

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(Par courriel : fred.sainte-croix@pc.gc.ca et poste) (En duplicata))

Le respect de l'environnement et la préservation de nos ressources naturelles sont des priorités pour Inspec-Sol inc. Dans cette perspective, nous imprimons nos documents recto-verso sur un papier 50 % recyclé.

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1.0 Introduction

Les services professionnels d'Inspec-Sol inc. (**Inspec-Sol**) ont été retenus par Parcs Canada, afin de réaliser une étude pédologique dans le tracé de la future route 132 (phase 2) dans le parc Forillon, à Gaspé, Québec. Le secteur investigué correspond à un segment de la future route entre les chaînages 2+550 et 4+000 (selon l'option 3, révision 3 du 3 novembre 2014). L'emplacement d'un futur ponceau au chaînage 4+420 a également été investigué.

Cette étude avait pour objectif de déterminer la nature et les caractéristiques des sols et du roc en place, afin de fournir des recommandations géotechniques concernant la construction de la route et du ponceau.

Le présent rapport rend compte de l'ensemble de nos travaux de terrain et de laboratoire effectués, fait état des résultats obtenus, puis présente des recommandations et commentaires concernant la construction de la future route et le ponceau. Ce rapport est accompagné de quatre (4) annexes contenant les éléments suivants :

- ◆ Annexe 1 : localisation des forages (dessins nos Q025238-A1-1 à Q025238-A1-8);
- ◆ Annexe 2 : rapports des forages;
courbes granulométriques;
- ◆ Annexe 3 : photographies, et;
- ◆ Annexe 4 : résultats « Chaussée 2 ».

2.0 Méthodologie

2.1 Travaux de terrain

Essentiellement, les travaux de terrain ont consisté en la réalisation de dix-huit (18) forages stratigraphiques répartis entre les chaînages 2+550 et 4+000. Deux (2) de ces forages ont cependant été réalisés près du chaînage 4+420, soit dans le secteur prévu du futur ponceau. Les emplacements des forages réalisés sont montrés aux dessins nos Q025238-A1-1 à Q025238-A1-8 de l'annexe 1.

Le programme de travail (nombre, localisation et profondeur des forages) a été déterminé par le client, en collaboration avec **Inspec-Sol**.

Les forages ont été réalisés au moyen d'une foreuse à tarière évidée de marque « CME-55S », montée sur un chenillard. La foreuse utilisée nous a permis de récupérer des échantillons de sol de façon régulière en utilisant un carottier fendu standard de

calibre « B ». Lors des prélèvements, des valeurs d'indice « N » de l'essai de pénétration standard ont été mesurées conformément à la norme BNQ-2501-140. Cet indice correspond au nombre de coups requis pour faire pénétrer la cuillère de 300 mm lorsque battue à l'aide d'un marteau pesant 63,5 kg et tombant en chute libre d'une hauteur de 760 mm. Les indices « N » mesurés sont présentés sur les rapports de forages.

Le socle rocheux a été carotté au moyen d'un carottier diamanté de calibre « NQ ».

À la fin de tous les forages, un tube d'observation a été installé afin de mesurer le niveau de l'eau dans le sol.

Les échantillons de sol et de roc prélevés dans les forages ont été apportés à notre laboratoire pour un examen visuel plus approfondi par un géotechnicien et pour fins d'essais en laboratoire. Ces échantillons seront conservés pendant une période d'un an après l'émission de ce rapport, après quoi nous en disposerons, à moins d'avis contraire de votre part.

Les coordonnées GPS ainsi que les élévations indiquées dans ce rapport sont en mètres et font référence au système géodésique. Les coordonnées en X et Y ont été relevés au moyen d'un GPS de marque « Garmin », modèle 62S.

Les élévations de la surface du sol indiquées sur les rapports de forages ont été interpolées à partir des plans transmis. Ces élévations sont en mètres et font référence au système géodésique.

Les travaux de chantier ont été réalisés les 6, 7 et 8 décembre 2014, ainsi que les 13, 14 et 15 janvier 2015, sous la supervision constante d'un membre de notre personnel technique.

2.2 Essais de laboratoire

En laboratoire, des échantillons de sol représentatifs provenant des forages ont été sélectionnés puis soumis à différents essais de caractérisation. Le nombre et la nature des essais effectués sont les suivants :

- ◆ Quinze (15) analyses granulométriques, et ;
- ◆ Quinze (15) teneurs en eau naturelle.

Les limites d'Atterberg initialement prévues n'ont pas été effectuées compte tenu que le pourcentage passant le tamis no 200 est inférieur à 50 %. Les résultats obtenus sont discutés au sein du texte, à la section 3.0 de ce rapport, tandis que les courbes granulométriques obtenues sont présentées à l'annexe 2.

3.0 Description sommaire des sols et du roc

Les forages effectués dans le cadre de ce mandat ont révélé des conditions de sol variables. Le tableau no 1 suivant fait la synthèse des unités stratigraphiques rencontrées au droit des forages.

Tableau no 1
Synthèse stratigraphique – Profondeur (m)

| Forage no | Élévation surface | Remblai | Sol naturel | Socle rocheux |
|-----------|-------------------|-------------|-------------|---------------|
| | (m) | Prof. (m) | Prof. (m) | Prof. (m) |
| F-2-1 | ND | 0,00 – 3,51 | 3,51 – 5,59 | 5,59 – 7,11 |
| F-2-2 | ND | 0,00 – 3,05 | 3,05 – 5,33 | 5,33 – 6,86 |
| F-2-3 | ± 16,86 | 0,00 – 1,52 | 1,52 – 2,72 | 2,72 – 4,72 |
| F-2-4 | ± 14,39 | 0,00 – 1,52 | 1,52 – 3,79 | 3,79 – 5,97 |
| F-2-5 | ± 14,28 | 0,00 – 1,52 | 1,52 – 4,27 | > 4,27 |
| F-2-6 | ± 11,01 | 0,00 – 1,52 | 1,52 – 4,27 | > 4,27 |
| F-2-7 | ± 5,71 | --- | 0,00 – 3,81 | > 3,81 |
| F-2-8 | ± 6,90 | --- | 0,00 – 3,81 | > 3,81 |
| F-2-9 | ± 7,28 | --- | 0,00 – 3,81 | > 3,81 |
| F-2-10 | ± 7,81 | --- | 0,00 – 1,52 | 1,52 – 1,78 |
| F-2-11 | ± 7,91 | --- | 0,00 – 1,07 | 1,07 – 2,11 |
| F-2-12 | ± 9,95 | --- | 0,00 – 1,52 | 1,52 – 1,93 |
| F-2-13 | ± 10,42 | --- | 0,00 – 1,52 | 1,52 – 2,21 |
| F-2-14 | ± 11,92 | --- | 0,00 – 1,52 | 1,52 – 2,57 |
| F-2-15 | ± 10,84 | 0,00 – 2,29 | 2,29 – 3,51 | 3,51 – 5,08 |
| F-2-16 | ± 7,99 | 0,00 – 1,52 | 1,52 – 2,87 | 2,87 – 4,11 |
| F-2-17 | ± 6,73 | 0,00 – 1,52 | 1,52 – 2,82 | 2,82 – 3,63 |
| F-2-18 | ± 6,15 | 0,00 – 0,76 | 0,76 – 2,82 | 2,82 |

Note :

- ND = non disponible
- : couche absente

Une description sommaire de chacune des couches est présentée aux sections suivantes.

3.1 Remblai

Une couche de remblai homogène a été rencontrée aux emplacements des forages F-2-1 à F-2-6, et de F-2-15 à F-2-18.

Cette couche correspond au remblai structural mis en place en 2014. Le remblai est composé de sable et gravier brun, avec des traces à un peu de silt. La couche était gelée sur environ 30 à 45 cm au moment des forages. **Soulignons que tous les échantillons de remblai soumis aux analyses granulométriques contenaient une quantité importante de béton bitumineux.**

Le tableau no 2 suivant présente les résultats des analyses granulométriques obtenus sur des échantillons de remblai.

Tableau no 2
Résultats des essais de laboratoire / Remblai

| Forage no | Échant. no | % des constituants | | | Classification unifiée |
|-----------|------------|--------------------|-------|---------|------------------------|
| | | Gravier | Sable | < 80 µm | |
| F-2-3 | CF-2 | 49 | 37 | 14 | GM-SM |
| F-2-3 | CF-2 | 14 | 60 | 26 | SM |
| F-2-4 | CF-1 | 34 | 47 | 19 | GM-SM |
| F-2-4 | CF-2 | 48 | 38 | 14 | GM-SM |
| F-2-5 | CF-1 | 33 | 53 | 14 | SM |
| F-2-6 | CF-2 | 7 | 70 | 23 | SM |
| F-2-15 | CF-2 | 10 | 61 | 29 | SM |
| F-2-16 | CF-1 | 31 | 50 | 19 | SM |
| F-2-17 | CF-1 | 27 | 51 | 22 | SM |
| F-2-18 | CF-1 | 31 | 54 | 15 | SM |

Sous la couche gelée, les sols sont de compacité moyenne à très dense. Les indices « N » obtenus dans cette couche sont indiqués sur les rapports de forages correspondants.

3.2 Sol naturel

Directement sous la couche de remblai ou en surface, on note la présence du sol naturel. Celui-ci est composé d'une couche de tourbe (forages F-2-7 à F-2-14) d'environ 15 cm d'épaisseur, suivie d'un dépôt de sable graveleux avec une peu à traces de silt ou de sable silteux avec un peu de gravier et des traces d'argile. **Soulignons que des odeurs d'hydrocarbures ont été notées à l'emplacement du forage F-2-4, entre 1,52 m et 3,05 m de profondeur.**

Les indices « N » obtenus dans ce dépôt varient entre 2 et 32, ce qui correspond à une compacité très lâche à dense.

Les analyses granulométriques effectuées sur des échantillons provenant du sol naturel sont présentées au tableau no 3 suivant :

Tableau no 3
Résultats des essais de laboratoire / Sol naturel

| Forage no | Échant. no | % des constituants | | | Teneur en eau % | Classification unifiée |
|-----------|------------|--------------------|-------|---------|-----------------|------------------------|
| | | Gravier | Sable | < 80 µm | | |
| F-2-7 | CF-2 | 26 | 57 | 17 | 25,6 | SW |
| F-2-7 | CF-3 | | | | 16,4 | --- |
| F-2-7 | CF-4 | | | | 10,5 | --- |
| F-2-8 | CF-2 | 35 | 34 | 31 | 11,9 | SM-GM |
| F-2-8 | CF-3 | | | | 15,4 | --- |
| F-2-9 | CF-2 | 40 | 42 | 18 | 14,4 | SW-GW |
| F-2-9 | CF-3 | | | | 17,3 | --- |
| F-2-10 | CF-2 | 31 | 22 | 47 | 19,6 | GM |
| F-2-11 | CF-1 | | | | 282,5 | --- |
| F-2-12 | CF-1 | | | | 27,1 | --- |
| F-2-12 | CF-2 | | | | 13,2 | --- |
| F-2-13 | CF-1 | | | | 24,8 | --- |
| F-2-13 | CF-2 | 29 | 47 | 24 | 19,6 | SM |
| F-2-14 | CF-1 | | | | 44,5 | --- |
| F-2-14 | CF-2 | | | | 28,1 | --- |

3.3 Socle rocheux

Le socle rocheux a été rencontré dans la majorité des forages, sauf aux emplacements des forages F-2-5 à F-2-9.

Le roc correspond à un mudstone gris-noir à gris foncé (roche sédimentaire), très altéré et friable.

4.0 Eau souterraine

Les niveaux de la nappe d'eau souterraine ont été relevés entre le 7 et le 15 janvier 2015 dans les tubes d'observation installés dans les forages. Le tableau no 4 suivant présente les résultats obtenus.

Tableau no 4
Profondeur de la nappe phréatique – Janvier 2015

| Forage | Profondeur (m) |
|--------|----------------|
| F-2-1 | 2,82 |
| F-2-2 | 2,19 |
| F-2-3 | 1,45 |
| F-2-4 | 1,52 |
| F-2-5 | 2,39 |
| F-2-6 | 1,80 |
| F-2-7 | 0,10 |
| F-2-8 | 1,01 |
| F-2-9 | 1,27 |
| F-2-10 | 1,33 |
| F-2-11 | 1,57 |
| F-2-12 | 1,17 |
| F-2-13 | 1,36 |
| F-2-14 | 1,42 |
| F-2-15 | Sec |
| F-2-16 | 1,31 |
| F-2-17 | 1,58 |
| F-2-18 | 1,40 |

Le niveau de l'eau dans le sol est cependant susceptible de fluctuer, à la hausse ou à la baisse, selon les saisons et/ou les conditions climatiques et peut donc se retrouver à des profondeurs différentes à d'autres périodes de l'année.

5.0 Recommandations et commentaires

Selon les informations transmises, le projet consistera à construire une nouvelle route sur une longueur d'environ 1,5 km, soit entre les chaînages 2+550 et 4+000. De plus, des murs de tête sont prévus d'être construits de part et d'autre du ponceau existant localisé au chaînage 4+420 environ.

Bien que le futur tronçon routier mesurera près de 1,5 km, les secteurs entre les chaînages 2+550 à 2+680 et 3+620 à 4+000 étaient déjà construits. Au moment de la réalisation des sondages, on y retrouvait déjà le remblai routier.

Entre les chaînages 2+680 et 3+620, la route n'était toujours pas construite au moment de la réalisation des forages. Certaines zones étaient aussi boisées. Selon les plans et profils transmis, ce secteur (chaînages 2+680 à 3+620) sera construit en remblai.

Basés sur les résultats des forages et des essais de laboratoire, les recommandations et commentaires géotechniques sont maintenant présentés.

5.1 Construction de la route 132

5.1.1 Préparation de l'emprise de la route (chaînages 2+680 à 3+620)

Considérant que le segment de route compris entre les chaînages 2+680 et 3+620 sera construit en remblai, nous sommes d'avis que la méthode de construction par remblai traditionnel peut être utilisée pour ce projet. En effet, la couche de terre végétale superficielle est relativement mince et elle pourra demeurer en place, en autant que le dessus du profil final de la chaussée soit à au moins 1,2 m au-dessus du terrain naturel existant.

Des recommandations similaires ont été présentées dans le rapport de la firme LVM (rapport daté du 8 juillet 2014). Comme indiqué dans leur rapport, les travaux de construction devront prendre en considération la présence d'une zone de terre noire dans le secteur du chaînage 3+320.

Outre les légers tassements reliés à la présence de la terre végétale et de la terre noire, peu de tassements devraient survenir dans les dépôts sous-jacents étant donné leur nature granulaire (sable et gravier ou sable silteux).

5.1.2 Drainage

Il est recommandé de prévoir des fossés de part et d'autre de la route ou aux endroits appropriés et ce, afin d'obtenir une durabilité accrue de la chaussée.

Des ponceaux devront aussi être installés dans les points bas afin de diriger les eaux de surface loin de la nouvelle route.

5.1.3 Réutilisation des sols d'excavation

Pour ce projet, le roc d'excavation (s'il y en a) ainsi que les couches de sable et gravier naturel pourront être réutilisés en partie pour le rehaussement du profil de la route, si la teneur en eau de ces matériaux est adéquate lors de la période de construction. Les couches de sable et gravier pourraient être réutilisées uniquement si ces matériaux sont asséchés au préalable. De plus, la réutilisation de ces matériaux sera cependant possible uniquement en période sèche et ensoleillée (été).

La tourbe et les couches de sable silteux ne pourront pas être réutilisées dans le cadre de ce projet.

S'il manque des matériaux pour ce projet, on devra importer des matériaux de type MG 112 afin de construire le remblai routier.

5.1.4 Transitions

Compte tenu que le segment de route à construire entre les chaînages 2+680 à 3+620 est essentiellement en remblai, aucune transition n'est requise.

5.1.5 Pentés de talus

Il est recommandé de prévoir des pentes de talus de l'ordre de 2,0 H : 1,0 V de part et d'autre de la route.

Un ensemencement des surfaces exposées est aussi recommandé pour éviter l'érosion.

5.1.6 Conception de la chaussée

La conception de la structure de chaussée été réalisée au moyen du logiciel «Chaussée 2» du MTQ. Les résultats du logiciel «Chaussée 2» du MTQ sont présentés à l'annexe 4 de ce rapport.

Les matériaux de fondation et les enrobés bitumineux devront être conformes aux exigences du Cahier des Charges et Devis Généraux du ministère des Transports du Québec, dernière édition.

Considérant la vocation de la nouvelle route 132 et basée sur les conditions de sol en place, nous recommandons la structure de chaussée suivante:

- ◆ Sous-fondation : 600 mm de matériaux de calibre MG 112, compactés à 95 % du Proctor modifié, placés en deux (2) couches;
- ◆ Fondation supérieure : 200 mm de pierre concassée de calibre MG 20, compactée à 98 % du Proctor modifié;
- ◆ Enrobés bitumineux :
 - ◆ Couche de base: 80 mm de GB-20
 - ◆ Couche de surface: 40 mm de ESG-10.

Cette structure a été calculée à l'aide du logiciel de chaussée 2 en tenant compte des données transmises par la firme Stantec le 13 février 2015. Ces données sont :

- ◆ DJMA de à 640 véhicules par jour;
- ◆ un pourcentage de camions estimé à 17 %, et;
- ◆ un taux d'accroissement de 2 %
- ◆ La profondeur « P » est égale à 2,25 m.

Nous avons aussi considéré que l'épaisseur totale des enrobés bitumineux sera posée dans une seule année.

5.2 Murs de tête du ponceau (F-2-1 et F-2-2 / chaînage 4+420)

À l'emplacement des forages F-2-1 et F-2-2, la résistance géotechnique des sols à l'ÉLUL est évaluée à 400 kPa.

La réaction géotechnique des sols à l'ÉLUT est estimée à 135 kPa. Sous cette contrainte, les tassements des murs de tête du ponceau seront inférieurs à 25 mm.

Cette valeur de tassement est valide pour autant que les murs de têtes soient placés sur des sols non remaniés, exempts de boue et de tout sol lâche.

Il est recommandé de prévoir un coussin d'assise d'un minimum de 200 mm d'épaisseur au niveau d'assise des murs de têtes. Ce coussin devrait être composé de pierre concassée de calibre MG 20, compacté à au moins 95% du Proctor modifié.

5.3 Inspection de chantier

Il est recommandé de faire inspecter les travaux de construction par un personnel compétent en géotechnique, afin de s'assurer que les travaux de terrassement soient réalisés selon les plans et devis.

Il est également recommandé de faire un suivi des travaux de compactage, afin de s'assurer que les degrés de compactage demandés soient effectivement atteints.

5.4 Considérations environnementales

Il est à noter que tous les échantillons de remblai soumis aux analyses granulométriques contenaient une quantité importante de béton bitumineux.

De plus, des odeurs d'hydrocarbures ont été notées à l'emplacement du forage F-2-4, entre 1,52 m et 3,05 m de profondeur.

6.0 Portée et limitations de l'étude

Ce rapport est destiné uniquement à « Parcs Canada » et aux autres parties explicitement identifiées dans ce rapport et pour qui il a été préparé. Les informations qui y sont contenues sont données au meilleur de notre connaissance et à la lumière des données disponibles à **Inspec-Sol** au moment de sa rédaction. Le rapport doit être pris comme un tout et doit inclure tous les plans et annexes correspondants : toute utilisation d'une partie séparée du rapport et son interprétation sera la responsabilité de l'utilisateur.

Toute réutilisation ou redistribution non autorisée du rapport à une tierce partie constitue un risque qui incombe uniquement au Client et à son destinataire et pour lequel **Inspec-Sol** ne peut être tenue responsable. Tout usage du rapport ou d'une partie séparée du rapport que pourrait en faire une tierce partie ou toute décision basée sur son contenu prise par cette tierce partie est la responsabilité de cette dernière. Le Client assumera la responsabilité de défendre, d'indemniser, ainsi que de dégager **Inspec-Sol** de toute responsabilité résultant de la distribution non autorisée du rapport par le Client.

Les recommandations formulées dans ce rapport sont basées sur notre compréhension actuelle du projet ainsi que sur l'utilisation, la topographie et les conditions actuelles du site, de même que sur la portée du mandat accordé par le Client et décrit dans le rapport. L'étude a été effectuée conformément aux règles et aux méthodes généralement reconnues par les

professionnels en géotechnique qui pratiquent dans les mêmes conditions et la même région, et aucune autre interprétation n'est permise. Tout usage que pourrait en faire une tierce partie ou toute décision basée sur son contenu, prise par cette tierce partie, est la responsabilité de cette dernière.

Tous les détails de conception et de construction sont rarement connus à la fin de l'étude géotechnique, et peuvent être modifiés en cours de projet. Les commentaires et recommandations présentés dans le rapport sont basés sur les résultats de notre étude et compréhension du projet tels que définis au moment de l'étude. Les services d'**Inspecc-Sol** devraient être retenus pour revoir ces recommandations et commentaires lorsque les plans et devis seront terminés. Sans cette révision, **Inspecc-Sol** ne pourra être tenue responsable de tout malentendu par rapport aux recommandations ou à l'application et à l'adaptation de celles-ci dans la conception finale.

Il est recommandé que les services d'**Inspecc-Sol** soient retenus durant la construction de toutes les fondations et durant les travaux de terrassement afin de s'assurer que les conditions du sous-sol sont similaires à celles observées durant l'étude et que nos recommandations sont bien comprises à toutes les étapes de construction.

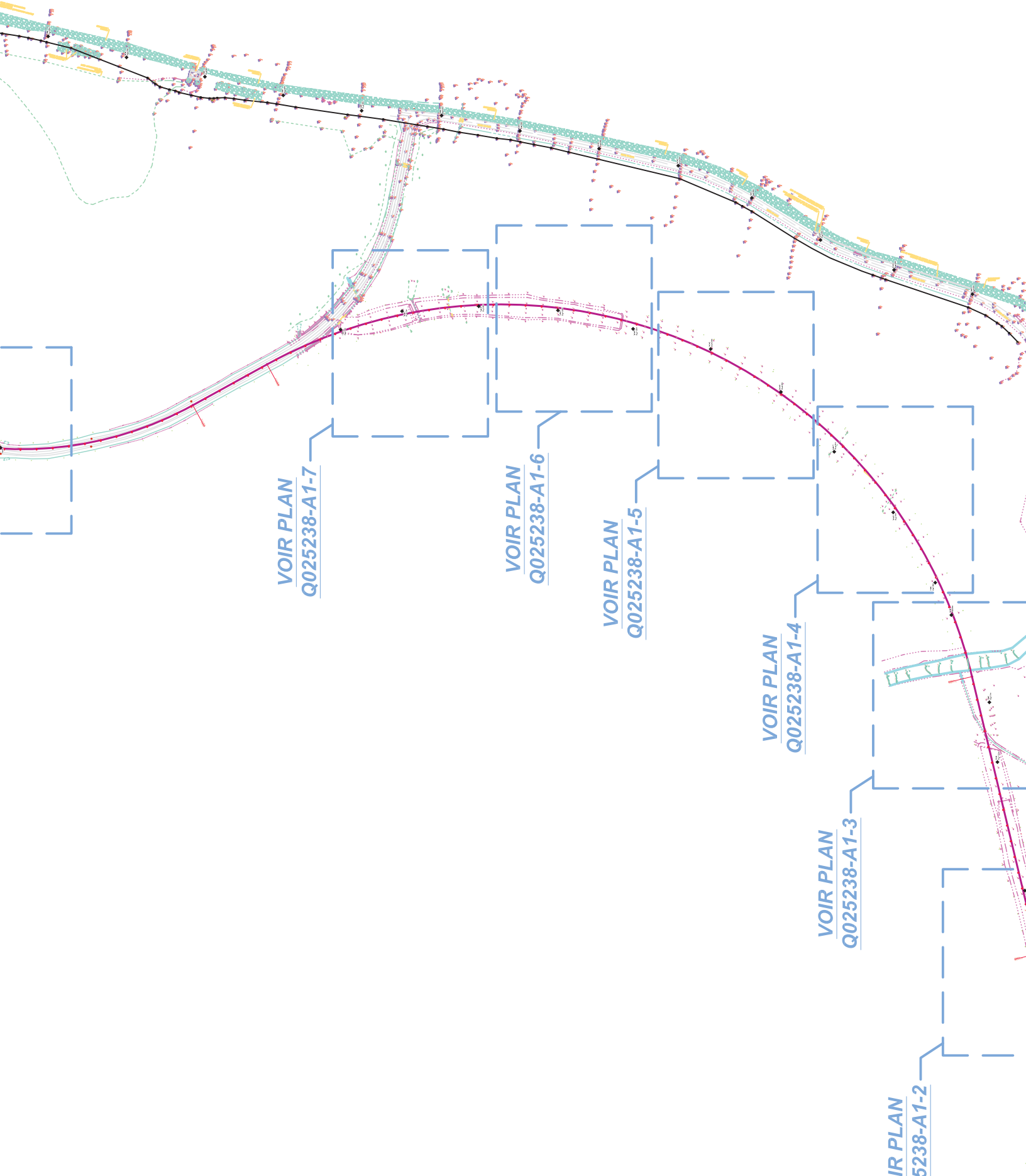
Il est important de souligner qu'une étude géotechnique consiste en un échantillonnage aléatoire et ponctuel d'un site et que les commentaires et recommandations inclus dans ce rapport sont basés sur les résultats obtenus uniquement aux emplacements des sondages (2 forages) réalisés dans le cadre de ce mandat. Les conditions géologiques présentées aux emplacements sondés sont celles qui ont été observées au moment de la réalisation des sondages et peuvent toutefois être modifiées de façon significative par des travaux de construction (excavation, drainage, dynamitage, fonçage de pieux) sur le site ou sur les sites adjacents. Elles peuvent aussi être modifiées par l'exposition des sols et du roc à l'humidité, au séchage ou au gel. Les conditions de sol et d'eau souterraine entre les sondages et au-delà de l'endroit investigué peuvent varier autant en plan qu'en profondeur par rapport aux résultats obtenus à l'emplacement des sondages. De plus, certaines conditions qui n'ont pu être observées ou prévues au moment de l'étude pourraient être rencontrées durant la construction. Dans l'éventualité où les conditions rencontrées sur le site devaient différer de celles observées à l'emplacement des sondages, nous demandons d'être immédiatement avisés par écrit afin de permettre une réévaluation de nos recommandations.

Si des conditions différentes sont identifiées durant la construction, sans égard au degré d'importance des changements, les recommandations émises dans le présent rapport seront considérées comme invalides jusqu'à ce que ces changements soient évalués par **Inspecc-Sol** et que les conclusions du rapport soient modifiées en conséquence ou maintenues par écrit.

GD/jl

Annexe 1

- ◆ Localisation des forages (dessins nos Q025238-A1-1 à Q025238-A1-8)



VOIR PLAN
Q025238-A1-7

VOIR PLAN
Q025238-A1-6

VOIR PLAN
Q025238-A1-5

VOIR PLAN
Q025238-A1-4

VOIR PLAN
Q025238-A1-3

VOIR PLAN
5238-A1-2

TOUTES LES INFO
 EXISTANTES

NUMÉRO:
 GA-14-738-DES-M

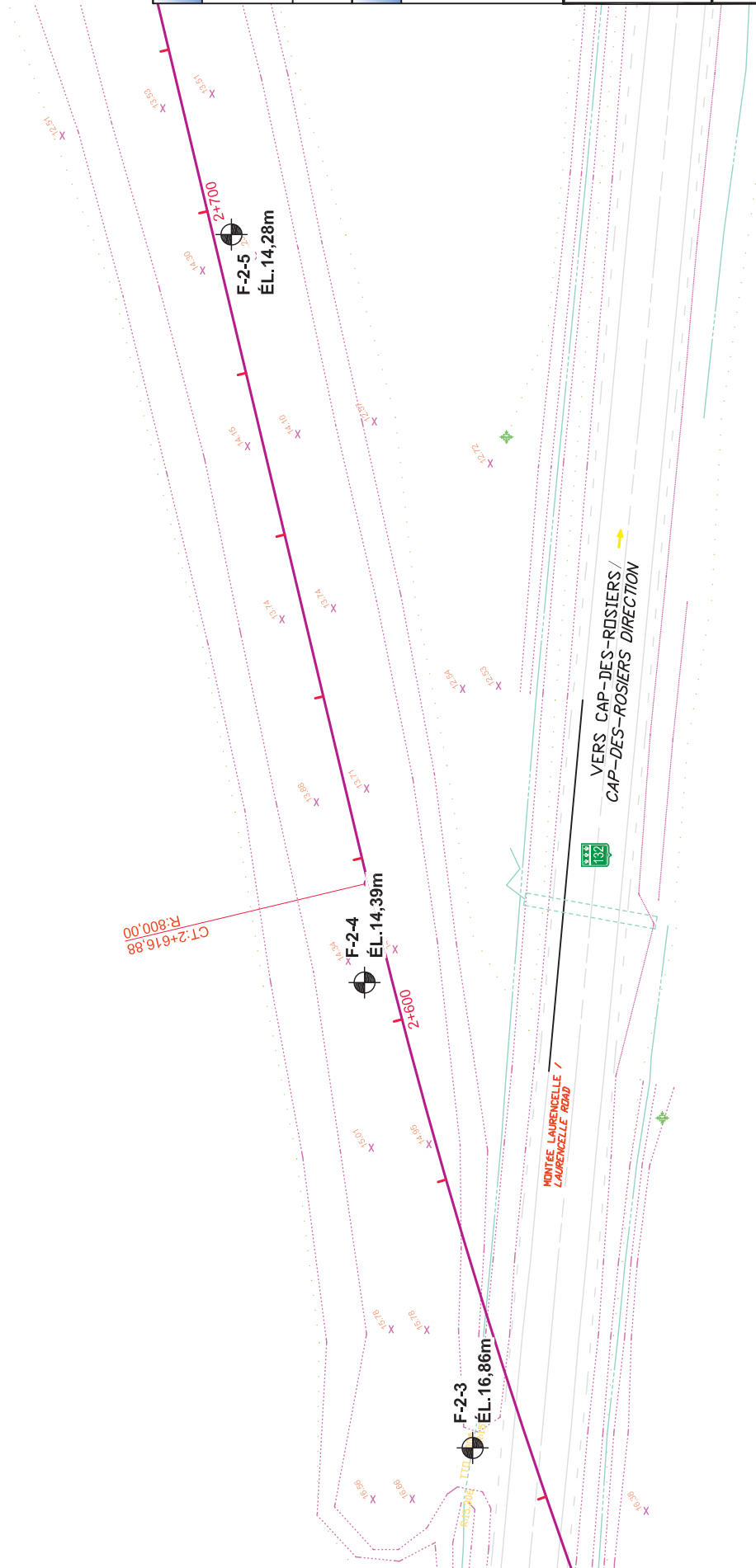
— AGR

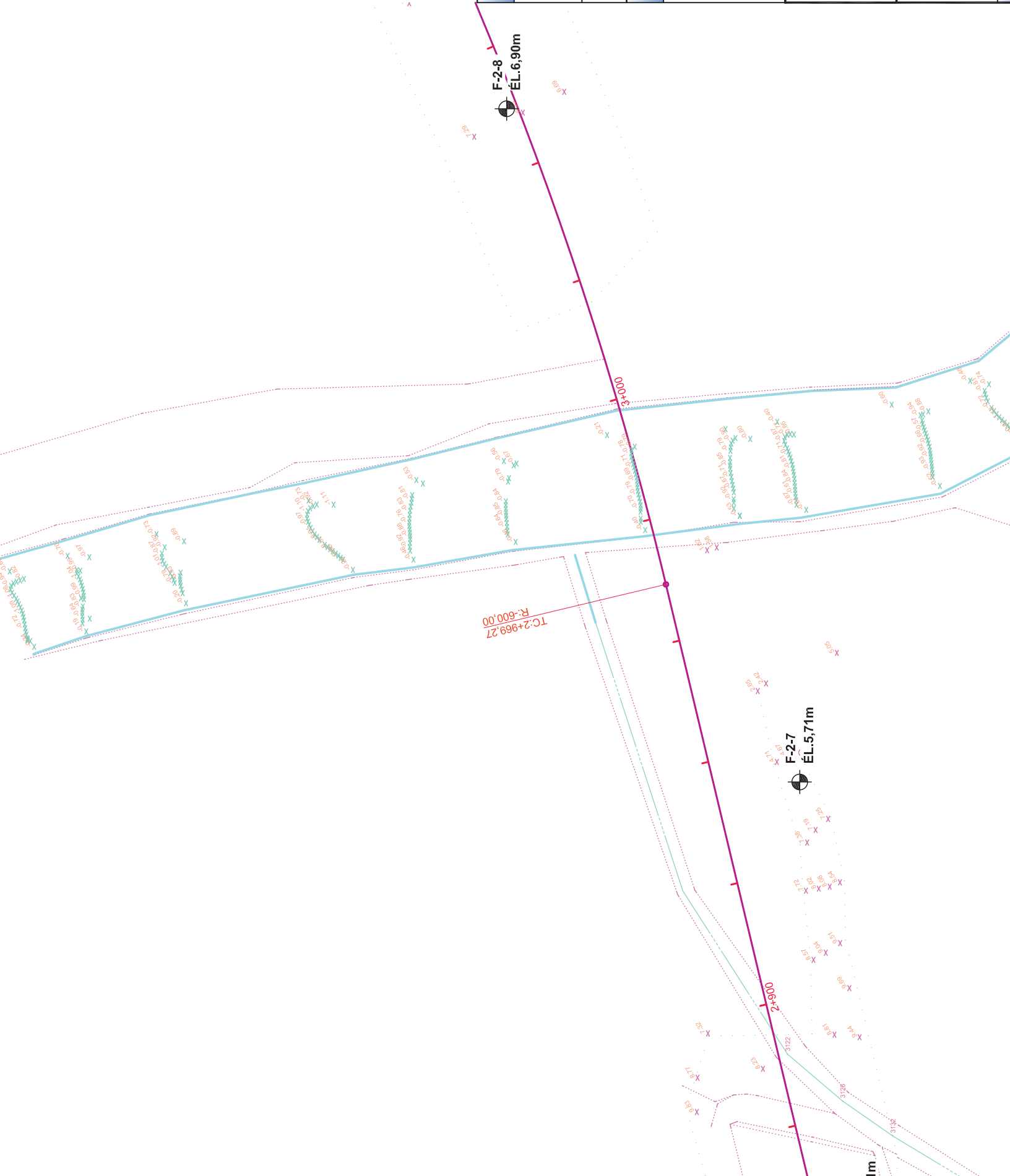


ÉTUDE PÉ

PAR

| | |
|--|-----------------|
| TOUTES LES INFORMATIONS EXISTANTES | |
| NUMÉRO: | GA-14-738-DES-M |
|  F-2-3 ÉL. 16,86m NOTE: LES ÉLÉVATIONS ONT ÉTÉ FOURNIES PAR LE CLIENT | |
|  0m | |
|  | |
| ÉTUDE PÉRIODIQUE | |





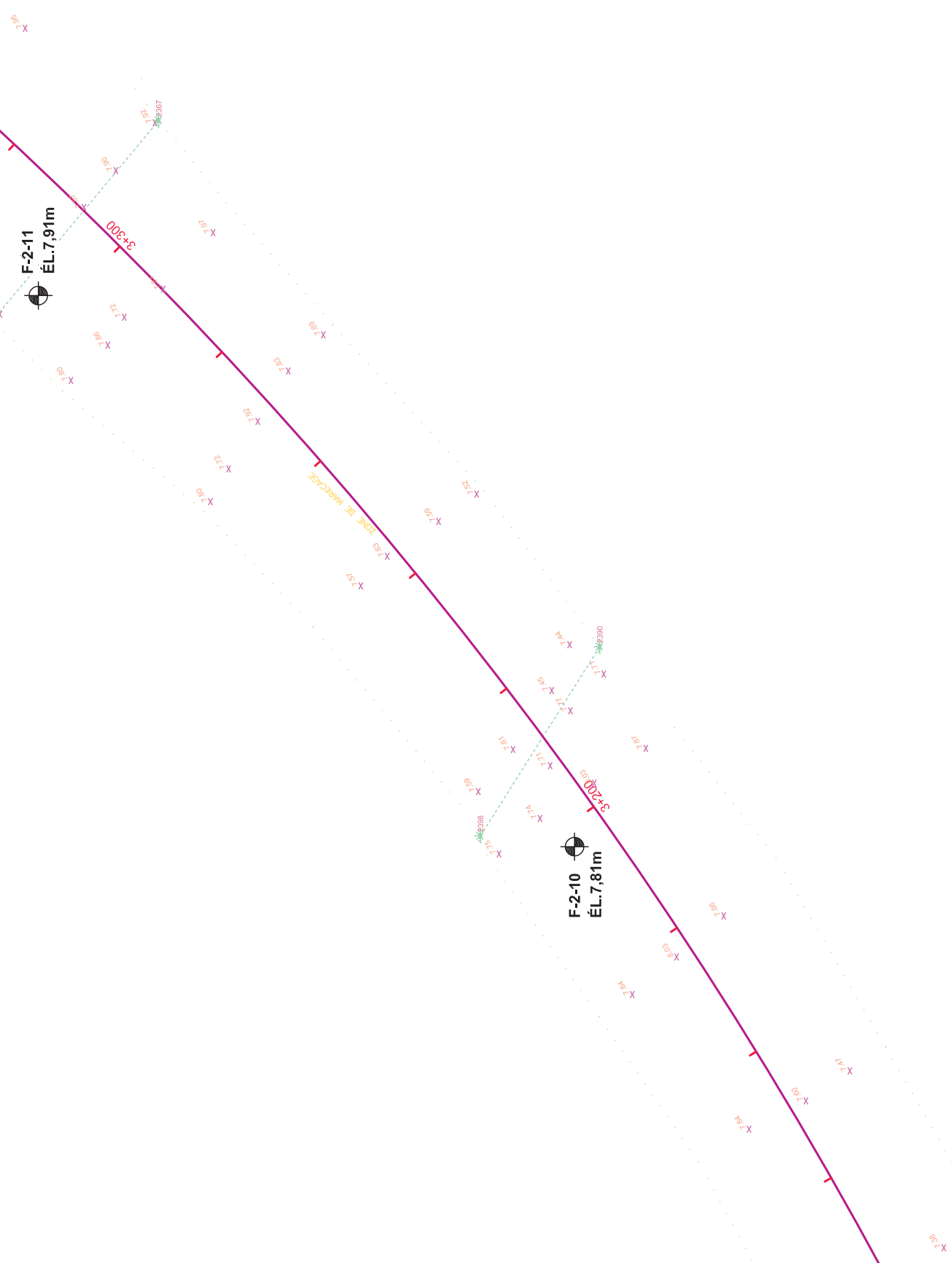
F-2-8
ÉL.6,90m



TC:2+969,27
R:600,00

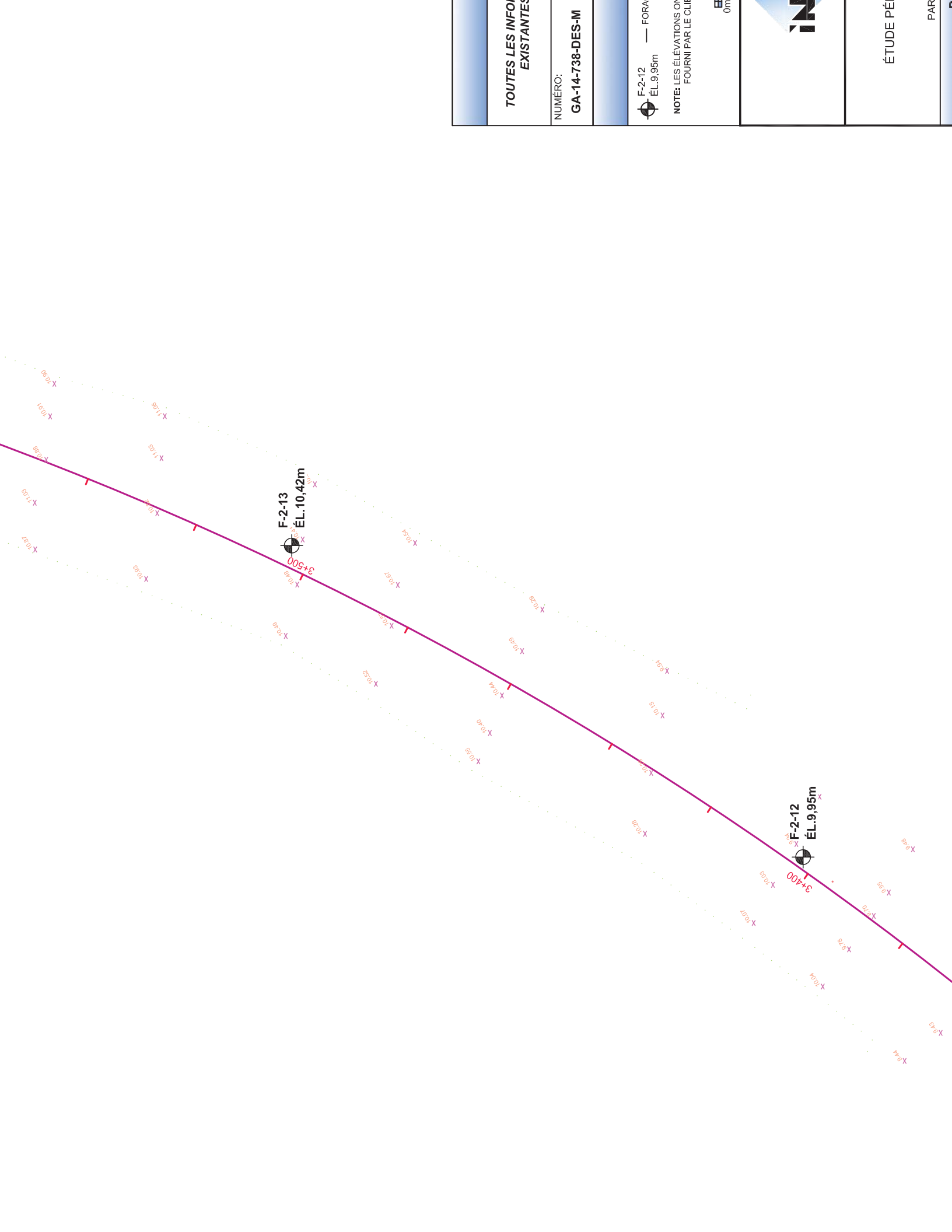
F-2-7
ÉL.5,71m

2+900

3+000



| | |
|--|-----------------|
| TOUTES LES INFO EXISTANTES | |
| NUMERO: | GA-14-738-DES-M |
|  F-2-9 FORA ÉL.7,28m | |
| NOTE: LES ÉLEVATIONS ON FOURNI PAR LE CLIE | |
| 0m | |
|  | |
| ÉTUDE PÉI | |
| PAR | |



TOUTES LES INFO
EXISTANTES

NUMERO:
GA-14-738-DES-M

F-2-12 — FORA
ÉL. 9,95m

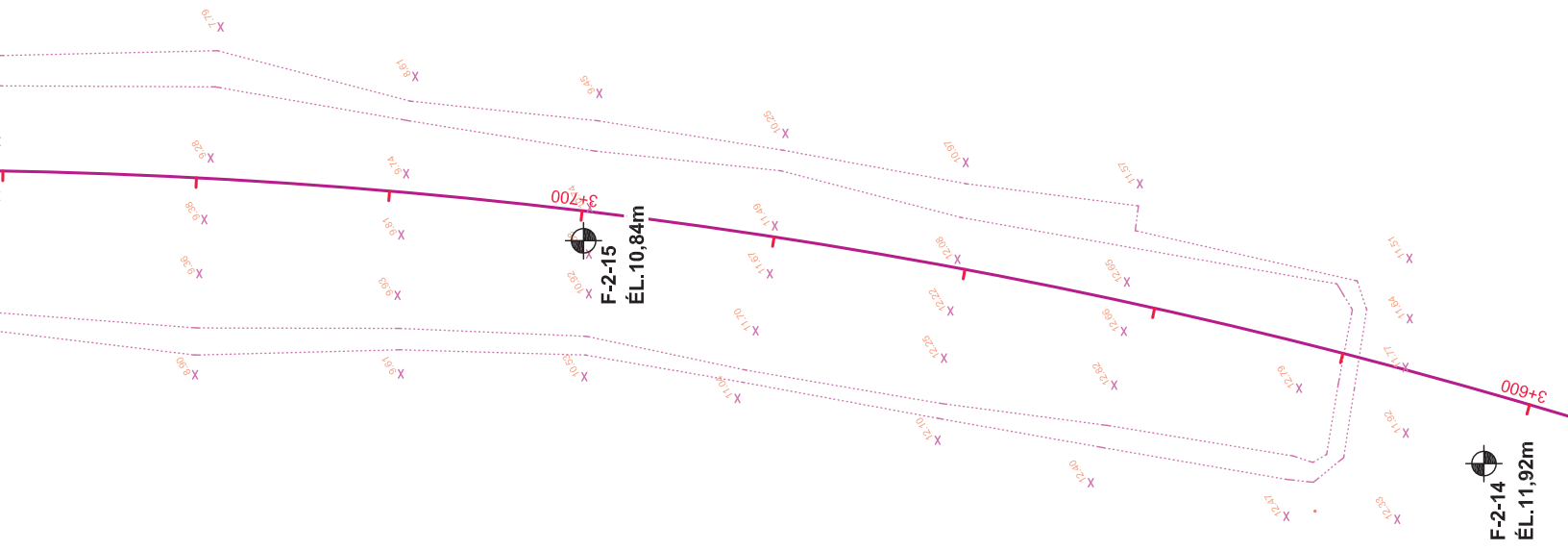
NOTE: LES ÉLEVATIONS ON
FOURNI PAR LE CLIE

0m



ÉTUDE PÉ

PAR



TOUTES LES INFO
EXISTANTES

NUMÉRO:
GA-14-738-DES-M

F-2-14
ÉL.11,92m

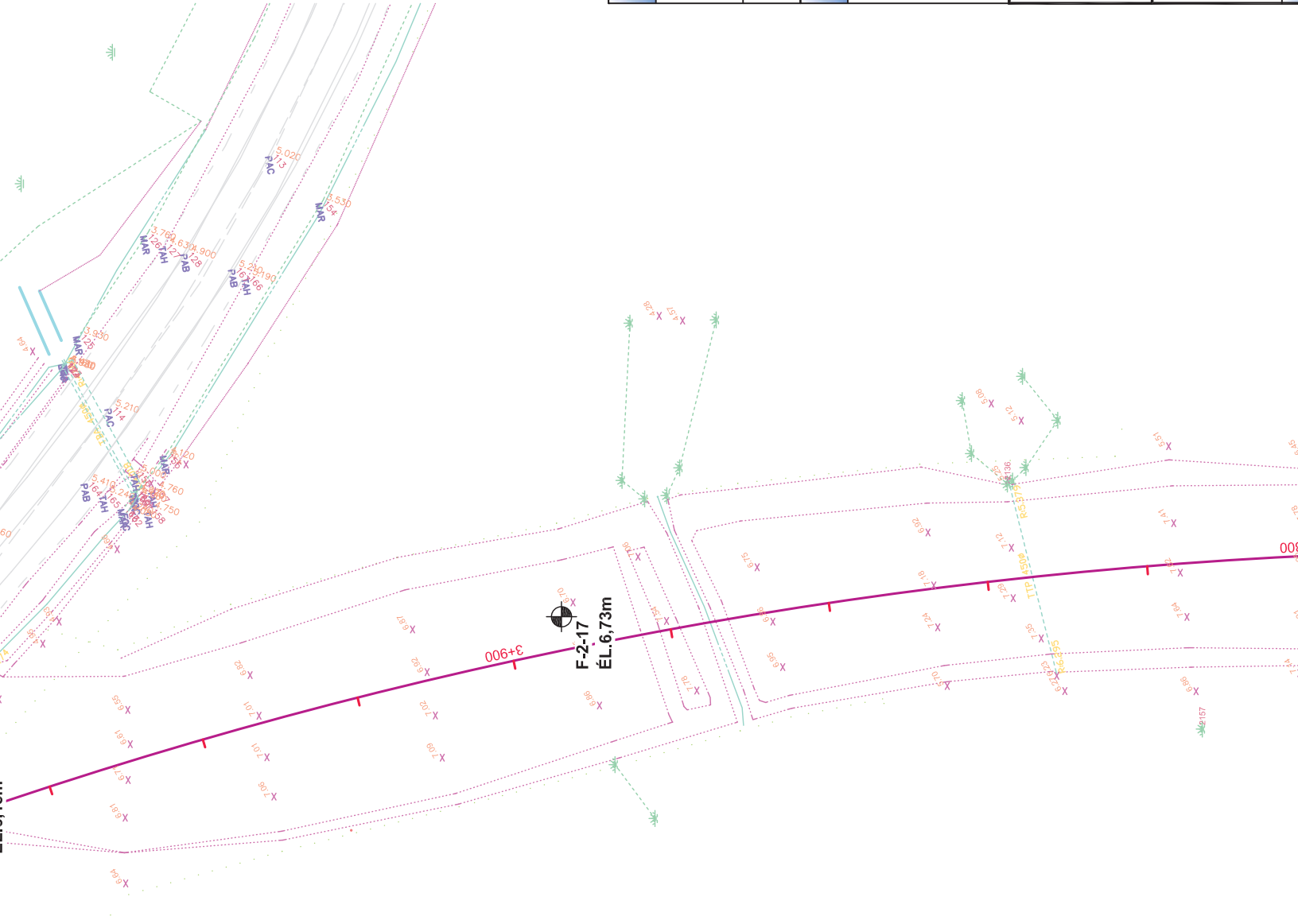
FORA
ÉL.11,92m

NOTE: LES ÉLEVATIONS ON
FOURNI PAR LE CLIE

0m



ÉTUDE PÉ
PAR



F-2-17
ÉL. 6,73m

3+900

TOUTES LES INFO
EXISTANTES

NUMÉRO:
GA-14-738-DES-M

F-2-16 — FORA
ÉL. 7,99m

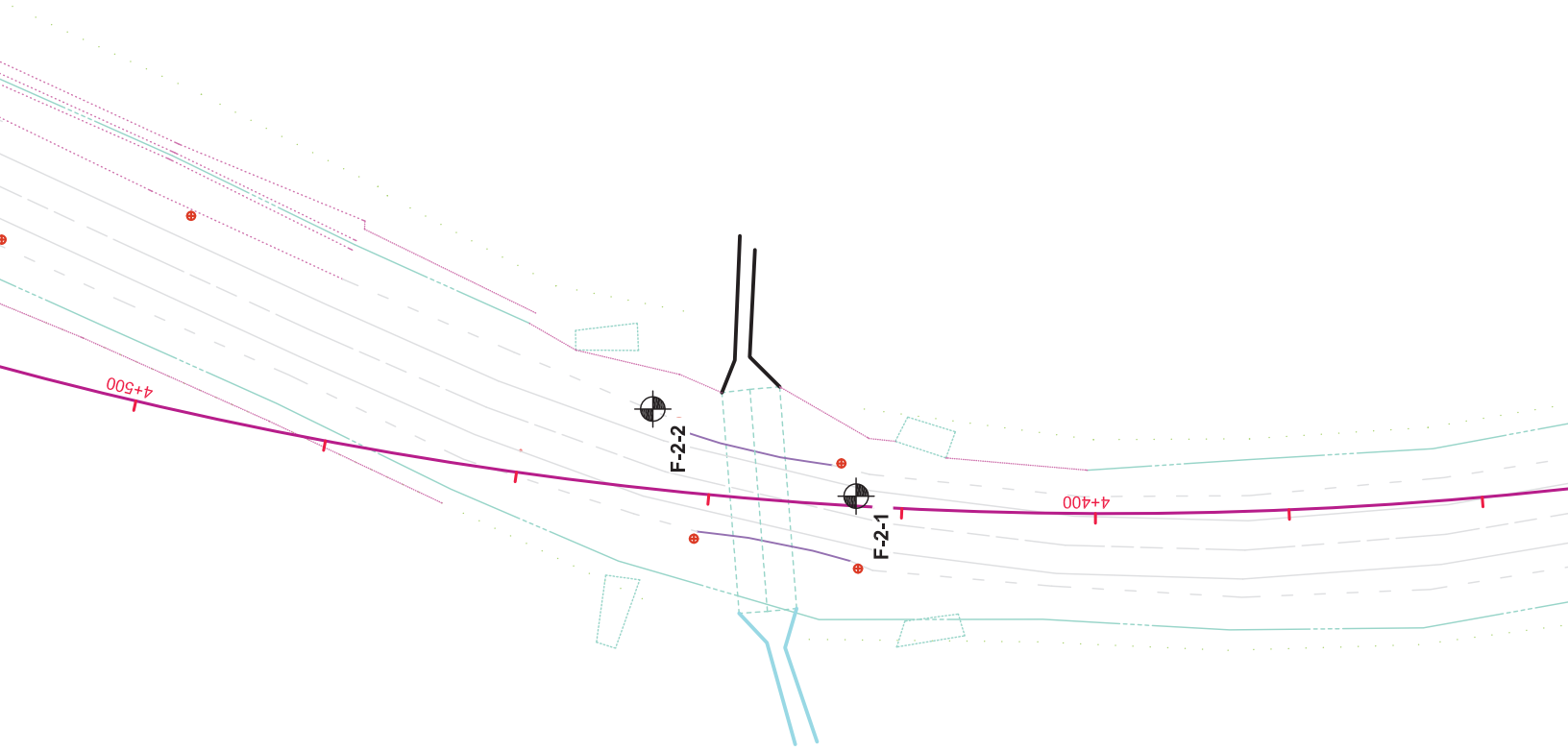
NOTE: LES ÉLEVATIONS ON
FOURNI PAR LE CLIE

0m



ÉTUDE PÉ

PAR



TOUTES LES INFO
EXISTANTES

NUMÉRO:

GA-14-738-DES-M

F-2-1 FORA

0m

IN

ÉTUDE PÉI

PAR

Annexe 2

- ◆ Rapports de forages
- ◆ Courbes granulométriques

DESCRIPTION DES SOLS:

Chacune des couches de mort-terrain est décrite selon la terminologie d'usage énumérée ci-après. La compacité des sols granulaires est définie par la valeur de l'indice de pénétration standard "N", et la consistance des sols cohérents par la résistance au cisaillement non drainé à l'état non remanié (Cu).









| CLASSIFICATION (SYSTÈME UNIFIÉ) | | | |
|---------------------------------|-----------------|----------|-----------------|
| Argile | < 0,002mm | | |
| Silt | 0,002 à 0,075mm | | |
| Sable | 0,075 à 4,75mm | fin | 0,075 à 0,425mm |
| | | moyen | 0,425mm à 2,0mm |
| | | grossier | 2,0 à 4,75mm |
| Gravier | 4,75 à 75mm | fin | 4,75mm à 19mm |
| | | grossier | 19 à 75mm |
| Cailloux | 75 à 300mm | | |
| Blocs | > 300mm | | |

| TERMINOLOGIE | |
|-----------------------------|----------|
| "traces" | 1 - 10% |
| "un peu" | 10 - 20% |
| adjectif (silteux, sableux) | 20 - 35% |
| "et" | 35 - 50% |

| COMPACTITÉ DES SOLS GRANULAIRES | INDICE DE PÉNÉTRATION STANDARD "N" (COUPS/PI. - 300mm) |
|---------------------------------|---|
| Très lâche | 0 - 4 |
| Lâche | 4 - 10 |
| Compact | 10 - 30 |
| Dense | 30 - 50 |
| Très dense | > 50 |

| CONSISTANCE DES SOLS COHÉRENTS | RÉSISTANCE AU CISAILLEMENT (Cu) | |
|--------------------------------|---------------------------------|-----------|
| | (lb./pi. ²) | (kPa) |
| Très molle | < 250 | < 12 |
| Molle | 250 - 500 | 12 - 25 |
| Ferme | 500 - 1000 | 25 - 50 |
| Raide | 1000 - 2000 | 50 - 100 |
| Très raide | 2000 - 4000 | 100 - 200 |
| Dure | > 4000 | > 200 |

| INDICE DE QUALITÉ DU ROC | |
|--------------------------|--------------|
| VALEUR "RQD" (%) | QUALIFICATIF |
| < 25 | très mauvais |
| 25 - 50 | mauvais |
| 50 - 75 | moyen |
| 75 - 90 | bon |
| > 90 | excellent |

| SYMBOLES DE LA STRATIGRAPHIE | | | |
|---|---|---|---|
|  |  |  |  |
| sable | gravier | cailloux et blocs | roc (calcaire) |
|  |  |  |  |
| silt | argile | sol organique | remblai |

ÉCHANTILLONS:

TYPE ET NUMÉRO

Le type d'échantillonneur utilisé est défini par l'abréviation indiquée ci-après. La numérotation est continue pour chacun des types.

| | | |
|--|-------------------------------|------------------------|
| CF: Cuillère fendue | TM: Tube à paroi mince | TA: Tarière |
| CFE, VRE, TAE: Échantillonnage environnemental | PS: Tube à piston (Osterberg) | CR: Carottier diamanté |
| | | VR: Vrac |

RÉCUPÉRATION

La récupération de l'échantillon est le rapport exprimé en pourcentage de la longueur récupérée dans l'échantillonneur à la longueur enfoncée.

RQD

Les indices de qualité du roc ("Rock Quality Designation" ou "RQD") sont définis comme étant le rapport exprimé en pourcentage de la longueur cumulée de tous les fragments de carottes de 4 pouces (10cm) ou plus à la longueur totale de la course.

ESSAIS DE CHANTIER:

| | | |
|-----------------------------------|--|-------------------------------------|
| N: Indice de pénétration standard | N _C : Indice de pénétration dynamique au cône | k: Perméabilité |
| R: Refus à l'enfoncement | Cu: Résistance au cisaillement non drainé | ABS: Absorption (eau sous pression) |
| | Pr: Pressiomètre | |

ESSAIS DE LABORATOIRE:

| | | | | |
|---------------------------------------|-----------------------------|------------------------|------------------------|----------------------|
| I _P : Indice de plasticité | H: Sédimentométrie | A: Limites d'Atterberg | C: Consolidation | VO: Vapeur organique |
| W _L : Limite liquide | AG: Analyse granulométrique | w: Teneur en eau | CS: Cône Suédois | |
| W _P : Limite plastique | | γ: Poids volumique | CHIM: Analyse chimique | |



RAPPORT DE FORAGE

FORAGE No: **F-2-1**

| | | |
|--|---|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325711.0 Y : 5412563.0 Z : | Date : 2015-01-12 Profondeur (m) : 2.82 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Calibre du carottier : Type de marteau : Rapport d'énergie : Date (début) : 2014-12-08 Date (fin) : 2014-12-08 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu |
| | | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|---|---------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--|--|--|--|--|--|--|--|--------------|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | Niveau d'eau |
| 0,0 | | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | | | | | | | | | |
| 0.0 - 3.51 | | | Remblai: Gravier et sable, un peu de silt, dense (sol gelé jusqu'à 0,45m) | État: Remanié | CF-1 | 63 | | | 24-31-13 15-13 | 44 | | | | | | | | | | |
| 0.0 - 2.0 | | | | État: Remanié | CF-2 | 60 | | | 16-18-17 20-14 | 35 | | | | | | | | | | |
| 0.0 - 2.0 | | | | État: Remanié | CF-3 | 77 | | | 11-15-23 34-34 | 38 | | | | | | | | | | |
| 0.0 - 3.0 | | | | État: Remanié | CF-4 | 50 | | | 20-15-14 11-10 | 29 | | | | | | | | | | |
| 3.51 - 5.59 | | | Sol naturel: Sable et gravier, un peu de silt, rougeâtre à gris, compact, saturé | État: Intact | CF-5 | 20 | | | 7-6-4 4-5 | 10 | | | | | | | | | | |
| 3.51 - 4.0 | | | | État: Intact | CF-6 | 30 | | | 7-4-6 13-17 | 10 | | | | | | | | | | |
| 4.0 - 5.59 | | | | État: Intact | CF-7 | 30 | | | 4-8-11 14-17 | 19 | | | | | | | | | | |
| 5.59 - 7.11 | | | Socle rocheux: Mudstone gris | État: Perdu | CF-8 | 100 | | | -- | R | | | | | | | | | | |
| 7.11 - 7.11 | | | Fin du forage | | CR-9 | 100 | | | | 47 | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPEC SOL 2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No:

F-2-2

| | | |
|--|---|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325720.0 Y : 5412584.0 Z : | Date : 2015-01-12 Profondeur (m) : 2.19 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Calibre du carottier : Type de marteau : Rapport d'énergie : Date (début) : 2014-12-08 Date (fin) : 2014-12-08 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu |
| | | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--|--|--|--|--|--|--|--|--------------|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ● Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | Niveau d'eau |
| 0,0 | | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | | | | | | | | | |
| 0.0 - 3.05 | | | Remblai: Sable et gravier, un peu de silt, brun-gris, compact à très dense (sol gelé jusqu'à 0,46m) | | CF-1 | 63 | | | 17-31-29 28-26 | 60 | | | | | | | | | | |
| 0.0 - 3.05 | | | | | CF-2 | 67 | | | 18-15-23 19-26 | 38 | | | | | | | | | | |
| 0.0 - 3.05 | | | | | CF-3 | 23 | | | 29-27-49 17-11 | 76 | | | | | | | | | | |
| 0.0 - 3.05 | | | | | CF-4 | 53 | | | 6-13-11 12-15 | 24 | | | | | | | | | | |
| 3.05 - 5.33 | 3.05 | | Sol naturel: Sable et gravier, un peu de silt à silteux, brun-rougeâtre, compact à très dense | | CF-5 | 50 | | | 4-6-6 12-23 | 12 | | | | | | | | | | |
| 3.05 - 5.33 | 3.05 | | | | CF-6 | 60 | | | 30-31-21 18-18 | 52 | | | | | | | | | | |
| 3.05 - 5.33 | 3.05 | | | | CF-7 | 67 | | | 3-11-9 36-33 | 20 | | | | | | | | | | |
| 5.33 - 6.86 | 5.33 | | Socle rocheux: Mudstone gris-verdâtre | | CR-8 | 100 | | | | 52 | | | | | | | | | | |
| 6.86 - 7.0 | 6.86 | | Fin du forage | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

2.19 m

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No:

F-2-3

| | | | | |
|---|------------------|--|------------------|--|
| CLIENT: Parcs Canada | | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | | ▼ - NIVEAU D'EAU Date : 2014-12-08 Profondeur (m) : 1.45 |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | | X : 325014.0 Y : 5411266.0 Z : 16.86 | | |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | DÉCRIT PAR: É. Harrison | | Plan de localisation : Q025238-A1-2 |
| | | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | | |
| Type de forage : Tarière | TYPE ÉCHANTILLON | CF(E) - Cuillère fendue (Environnement) | ÉTAT ÉCHANTILLON | <input checked="" type="checkbox"/> Remanié |
| Calibre du carottier : NQ | | CR(E) - Carottier diamanté | | <input checked="" type="checkbox"/> Intact |
| Type de marteau : | | TA(E) - Tarière | | <input type="checkbox"/> Forage au diamant |
| Rapport d'énergie : | | TEE - Tube Échantillonnage Environnement | | <input checked="" type="checkbox"/> Perdu |
| Date (début) : 2014-12-06 | | TM - Tube à paroi mince | | |
| Date (fin) : 2014-12-07 | VR(E) - Vrac | | | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--------------|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ◻ Limites d'Atterberg (%) ◻ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 16.86 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | Niveau d'eau | | | | | | | | |
| 0.76 | 16.10 | | Remblai: Gravier et sable, un peu de silt, brun, compact (sol gelé jusqu'à 0,30m), présence de béton bitumineux | | CF-1 | 63 | AG | | 19-29-18 13-12 | 31 | | | | | | | | | | |
| 1.52 | 15.34 | | Remblai: Sable silteux, un peu de gravier, brun, compact | | CF-2 | 80 | AG | | 17-11-9 6-6 | 20 | | | | | | | | | | |
| 2.72 | 14.14 | | Sol naturel: Sable et gravier, un peu de silt, gris, dense | | CF-3 | 63 | | | 10-20-17 21-22 | 37 | | | | | | | | | | |
| | | | | | CF-4 | 71 | | | 20-47 50/13cm | R | | | | | | | | | | |
| | | | Socle rocheux: Mudstone, gris-noir, de très mauvaise qualité | | CR-5 | 71 | | | | 0 | | | | | | | | | | |
| | | | | | CR-6 | 50 | | | | 0 | | | | | | | | | | |
| 4.72 | 12.14 | | Fin du forage | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-4

| | | |
|---|--|---|
| CLIENT: Parcs Canada PROJET: Étude pédologique et géologique - Phase 2 - Route 132 LOCALISATION: Parc Forillon, Gaspé (Québec) DÉCRIT PAR: É. Harrison VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) X : 325073.0 Y : 5411279.0 Z : 14.39 | ▼ - NIVEAU D'EAU Date : 2014-12-07 Profondeur (m) : 1.52 Plan de localisation : Q025238-A1-2 |
|---|--|---|

| | | | |
|---|--|--|--|
| Type de forage : Tarière Calibre du carottier : NQ Type de marteau : Rapport d'énergie : Date (début) : 2014-12-06 Date (fin) : 2014-12-06 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |
|---|--|--|--|

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | | |
|-----------------------|---------------|---------|---|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--|--|--|--|--|--|--|--|--------------|-------------|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | Niveau d'eau | |
| 0,0 | 14.39 | | Surface du sol | | | | | | | | W _p W _L 10 20 30 40 50 60 70 80 90 | | | | | | | | | | |
| 0.76 | 13.63 | ⊠ | Remblai: Sable graveleux, un peu de silt, brun, compact (sol gelé jusqu'à 0,30m) | ⊠ | CF-1 | 57 | AG | | 19-30-12 10-14 | 42 | ● | | | | | | | | | | 1.52 m ▼ |
| 1.52 | 12.87 | ⊠ | Remblai: Gravier et sable, un peu de silt, brun, compact, présence de béton bitumineux | ⊠ | CF-2 | 43 | AG | | 14-12-7 7-8 | 19 | ● | | | | | | | | | | |
| 2.0 | | ⊠ | Sol naturel: Sable et gravier silteux, brun, lâche à dense (odeur d'hydrocarbures de 1,52m à 3,05m) | ⊠ | CF-3 | 80 | | | 2-3-5 4-4 | 8 | ● | | | | | | | | | | |
| 3.0 | | ⊠ | | ⊠ | CF-4 | 53 | | | 3-6-27 22-30 | 33 | ● | | | | | | | | | | |
| 4.0 | | ⊠ | | ⊠ | CF-5 | 58 | | | 16-14 24-46 | 38 | ● | | | | | | | | | | |
| 3.79 | 10.60 | ⊠ | Socle rocheux: Mudstone gris, de qualité très mauvaise | ⊠ | CF-6 | 100 | | | 50/13cm | R | R | | | | | | | | | | |
| 5.0 | | ⊠ | | ⊠ | CR-7 | 38 | | | | 0 | 0 | | | | | | | | | | |
| 6.0 | | ⊠ | | ⊠ | CR-8 | 100 | | | | 24 | 24 | | | | | | | | | | |
| 5.97 | 8.42 | | Fin du forage | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: **F-2-5**

| | | |
|---|--|--|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325163.0 Y : 5411295.0 Z : 14.28 | Date : 2014-12-07 Profondeur (m) : 2.39 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. |
| Type de forage : Tarière Calibre du carottier : NQ Type de marteau : Rapport d'énergie : Date (début) : 2014-12-06 Date (fin) : 2014-12-06 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu |
| | | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | | | |
|-----------------------|---------------|---------|---|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|----|----|----|----|----|----|----|----|--------------|-------------|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | | | |
| 0,0 | 14.28 | | Surface du sol | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | Niveau d'eau | | |
| | | | Remblai: Sable graveleux, un peu de silt, brun, compact, humide, présence de béton bitumineux | | CF-1 | 67 | AG | | 17-8-6 8-14 | 14 | | | | | | | | | | | 2.39 m ▼ | |
| 1.0 | | | | | CF-2 | 40 | | | 8-7-6 8-9 | 13 | | | | | | | | | | | | |
| 1.52 | 12.76 | | Sol naturel: Sable silteux, traces de gravier, brun, lâche | | CF-3 | 57 | | | 4-4-4 5-5 | 8 | | | | | | | | | | | | |
| 2.0 | | | | | CF-4 | 2 | | | 6-4-5 3-3 | 9 | | | | | | | | | | | | |
| 3.05 | 11.23 | | Sable et gravier silteux, brun, lâche à compact, saturé | | CF-5 | 33 | | | 2-2-1-3 | 3 | | | | | | | | | | | | |
| 4.0 | | | | | CF-6 | 50 | | | 3-4-7-11 | 11 | | | | | | | | | | | | |
| 4.27 | 10.01 | | Fin du forage | | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-6

| | | |
|---|---|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325322.0 Y : 5411329.0 Z : 11.01 | Date : 2014-12-07 Profondeur (m) : 1.8 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Tarière Calibre du carottier : NQ Type de marteau : Rapport d'énergie : Date (début) : 2014-12-06 Date (fin) : 2014-12-06 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu |
| | | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|----|----|----|----|----|----|----|----|--------------|------------|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ◻ Limites d'Atterberg (%) ◻ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | | | |
| 0,0 | 11.01 | | Surface du sol | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | Niveau d'eau | | |
| 0.5 | | | Remblai: Sable silteux, traces de gravier, brun, lâche, humide, présence de morceaux de bois | | CF-1 | 33 | | | 6-5-4 4-3 | 9 | | | | | | | | | | | 1.8 m ▼ | |
| 1.0 | | | | | CF-2 | 80 | AG | | 2-2-2 6-6 | 4 | | | | | | | | | | | | |
| 1.52 | 9.49 | | Sol naturel: Sable et gravier, un peu de silt à silteux, brun, lâche à compact, humide à saturé | | CF-3 | 63 | | | 2-4-3 3-3 | 7 | | | | | | | | | | | | |
| 2.0 | | | | | CF-4 | 57 | | | 1-2-2 3-7 | 4 | | | | | | | | | | | | |
| 3.0 | | | | | CF-5 | 50 | | | 12-5 10-13 | 15 | | | | | | | | | | | | |
| 4.0 | | | | | CF-6 | 83 | | | 23-8-8 37-2 | 16 | | | | | | | | | | | | |
| 4.27 | 6.74 | | Fin du forage | | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: **F-2-7**

| | | | |
|---|--|---|---------------------|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU | |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325396.0 | Date : 2015-01-14 | |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | Y : 5411339.0 | Profondeur (m) : 0.1 | |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | Plan de localisation : Q025238-A1-2 | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé | |
| Calibre du carottier : NQ | CF(E) - Cuillère fendue (Environnement) | | ☒ Remanié |
| Type de marteau : Mécanique | CR(E) - Carottier diamanté | | ☒ Intact |
| Rapport d'énergie : | TA(E) - Tarière | | ☐ Forage au diamant |
| Date (début) : 2014-01-13 | TEE - Tube Échantillonnage Environnement | | ■ Perdu |
| Date (fin) : 2015-01-13 | TM - Tube à paroi mince | | |
| | VR(E) - Vrac | | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ○ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 5.71 | | Surface du sol | | | | | | | | W _p W _L 10 20 30 40 50 60 70 80 90 | | | | | | | | | |
| | | | Sol naturel: Sable graveleux, un peu de silt, brun, compact, saturé | ☒ | CF-1 | 20 | | | 4-1-1 0-1 | 2 | ● | | | | | | | | | |
| | | | Sable silteux, un peu de gravier, traces d'argile, brun-gris, compact | ☒ | CF-2 | 27 | AG - w | | 3-6-7 7-8 | 13 | ● ○ | | | | | | | | | |
| | | | Sable silteux, un peu de gravier, traces d'argile, brun-gris, compact | ☒ | CF-3 | 17 | w | | 4-5-5 3-6 | 10 | ● ○ | | | | | | | | | |
| 2.29 | 3.42 | | Sable silteux, un peu de gravier, traces d'argile, brun-gris, compact | ☒ | CF-4 | 57 | w | | 3-4-6 8-8 | 10 | ● | | | | | | | | | |
| | | | Sable silteux, un peu de gravier, traces d'argile, brun-gris, compact | ☒ | CF-5 | 40 | | | 6-6-8 8-9 | 14 | ● | | | | | | | | | |
| 3.81 | 1.90 | | Fin du forage | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: **F-2-8**

| | | | |
|---|---|---|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU | |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325504.0 Y : 5411386.0 Z : 6.90 | Date : 2014-01-15 Profondeur (m) : 1.01 | |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 | |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé | |
| Calibre du carottier : NQ | CF(E) - Cuillère fendue (Environnement) | | ÉTAT ÉCHANTILLON |
| Type de marteau : Mécanique | CR(E) - Carottier diamanté | | <input checked="" type="checkbox"/> Remanié |
| Rapport d'énergie : | TA(E) - Tarière | | <input checked="" type="checkbox"/> Intact |
| Date (début) : 2015-01-13 | TEE - Tube Échantillonnage Environnement | | <input type="checkbox"/> Forage au diamant |
| Date (fin) : 2015-01-13 | TM - Tube à paroi mince | <input type="checkbox"/> Perdu | |
| | VR(E) - Vrac | | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | | |
|-----------------------|---------------|---------|---|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|----|----|----|----|----|----|----|----|--------------|--------|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ◻ Limites d'Atterberg (%) ◻ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | | |
| 0,0 | 6.90 | | Surface du sol | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | Niveau d'eau | |
| | | | Sol naturel: Gravier sableux et silteux, brun à rougeâtre, compact, humide | | CF-1 | 27 | | | 0-1-0 1-1 | 1 | | | | | | | | | | | 1.01 m |
| | | | | | CF-2 | 47 | AG - w | | 5-6-5 7-8 | 11 | | | | | | | | | | | |
| | | | | | CF-3 | 40 | w | | 7-8-6 7-9 | 14 | | | | | | | | | | | |
| | | | | | CF-4 | 40 | | | 9-9-10 12-13 | 19 | | | | | | | | | | | |
| | | | | | CF-5 | 50 | | | 9-12-13 14-11 | 25 | | | | | | | | | | | |
| 3.81 | 3.09 | | Fin du forage | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: **F-2-9**

| | | | |
|---|---|---|---------------------|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU | |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325544.0 Y : 5411406.0 Z : 7.28 | Date : 2014-01-15 Profondeur (m) : 1.27 | |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 | |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé | |
| Calibre du carottier : | CF(E) - Cuillère fendue (Environnement) | | ☒ Remanié |
| Type de marteau : Mécanique | CR(E) - Carottier diamanté | | ☒ Intact |
| Rapport d'énergie : | TA(E) - Tarière | | ☐ Forage au diamant |
| Date (début) : 2015-01-14 | TEE - Tube Échantillonnage Environnement | | ■ Perdu |
| Date (fin) : 2015-01-15 | TM - Tube à paroi mince | | |
| | VR(E) - Vrac | | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|----|----|----|----|----|----|----|----|--------------|----------|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ○ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | | |
| 0,0 | 7.28 | | Surface du sol | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | Niveau d'eau | |
| 0.15 | 7.13 | | Sol naturel: Tourbe Sable et gravier, un peu de silt, compact | ☒ | CF-1 | 27 | | | 1-1-2 2-2 | 3 | | | | | | | | | | | ▼ 1.27 m |
| 1.0 | | | | ☒ | CF-2 | 40 | AG - w | | 2-6-9 11-13 | 15 | | | | | | | | | | | |
| 2.0 | | | | ☒ | CF-3 | 33 | w | | 9-9-9 9-10 | 18 | | | | | | | | | | | |
| 3.0 | | | | ☒ | CF-4 | 33 | | | 7-7-8 9-11 | 15 | | | | | | | | | | | |
| 3.05 | 4.23 | | Devenant dense | ☒ | CF-5 | 60 | | | 11-17-15 19-20 | 32 | | | | | | | | | | | |
| 3.81 | 3.47 | | Fin du forage | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: **F-2-10**

| | | |
|--|--|--|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325631.0 Y : 5411458.0 Z : 7.81 | Date : 2014-01-15 Profondeur (m) : 1.33 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS |
| Calibre du carottier : Type de marteau : Mécanique Rapport d'énergie : Date (début) : 2015-01-14 Date (fin) : 2015-01-15 | CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | |
| | ÉTAT ÉCHANTILLON | |
| | <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input checked="" type="checkbox"/> Perdu | AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------------------|---|--------------|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 7.81 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | Niveau d'eau | | | | | | | | |
| 0.15 | 7.66 | | Sol naturel: Tourbe | | | | | | | | | | | | | | | | | |
| | | | Silt graveleux et sableux, lâche à compact | | CF-1 | 33 | | | 3-3-2 3-4 | 5 | | | | | | | | | | |
| 1.0 | | | | | CF-2 | 47 | AG - w | | 5-4-25 28-50 | 29 | | | | | | | | | | |
| 1.52 | 6.29 | | Socle rocheux: Mudstone altéré et friable | | CF-3 | 80 | | | 58 | R | | | | | | | | | | |
| 1.78 | 6.03 | | Fin du forage | | | | | | 50/11cm | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-11

| | | |
|---|--|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325706.0 | Date : 2014-01-15 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | Y : 5411531.0 | Profondeur (m) : 1.57 |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | Plan de localisation : Q025238-A1-2 |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ÉTAT ÉCHANTILLON |
| Calibre du carottier : | CF(E) - Cuillère fendue (Environnement) | <input checked="" type="checkbox"/> Remanié |
| Type de marteau : Mécanique | CR(E) - Carottier diamanté | <input checked="" type="checkbox"/> Intact |
| Rapport d'énergie : | TA(E) - Tarière | <input type="checkbox"/> Forage au diamant |
| Date (début) : 2015-01-14 | TEE - Tube Échantillonnage Environnement | <input checked="" type="checkbox"/> Perdu |
| Date (fin) : 2015-01-15 | TM - Tube à paroi mince | |
| | VR(E) - Vrac | |
| | | ESSAIS RÉALISÉS |
| | | AG: analyse granulométrique |
| | | SD: analyse sédimentométrique |
| | | W _L : limite liquide |
| | | W _p : limite plastique |
| | | w : teneur en eau |
| | | C _u : cisaillement non drainé |
| | | S _r : sensibilité |
| | | Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | |
|-----------------------|---------------|---------|---|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------------------|---|--------------|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ W _p W _L Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 7.91 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | Niveau d'eau | | | | | | | | |
| 0.15 | 7.76 | | Sol naturel: Tourbe Sable silteux, traces de gravier, lâche | | CF-1 | 13 | w | | 1-1-1 1-1 | 2 | 282.5 | ▼ 1.57 m | | | | | | | | |
| 1.0 | 6.84 | | Socle rocheux: Mudstone altéré et friable | | CF-2 | 63 | | | 1-1-12 15-16 | 13 | | | | | | | | | | |
| 2.0 | 5.80 | | Fin du forage | | CF-3 | 100 | | | 25-33-46 50/13cm | R | | | | | | | | | | |
| 2.11 | | | | | | | | | | | | | | | | | | | | |
| 3.0 | | | | | | | | | | | | | | | | | | | | |
| 4.0 | | | | | | | | | | | | | | | | | | | | |
| 5.0 | | | | | | | | | | | | | | | | | | | | |
| 6.0 | | | | | | | | | | | | | | | | | | | | |
| 7.0 | | | | | | | | | | | | | | | | | | | | |
| 8.0 | | | | | | | | | | | | | | | | | | | | |
| 9.0 | | | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPEC SOL 2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-12

| | | |
|--|---|--|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325780.0 Y : 5411597.0 Z : 9.95 | Date : 2014-01-15 Profondeur (m) : 1.17 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS |
| Calibre du carottier : Type de marteau : Mécanique Rapport d'énergie : Date (début) : 2015-01-14 Date (fin) : 2015-01-15 | CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | |
| | ÉTAT ÉCHANTILLON | |
| | <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu | AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------------------|---|----|----|----|----|----|----|----|----|--------|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| | | | | | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 0,0 | 9.95 | | Surface du sol | | | | | | | | | | | | | | | | | |
| 0.15 | 9.80 | | Sol naturel: Tourbe Sable silteux, traces à un peu de gravier, lâche | | CF-1 | 33 | w | | 1-1-1 1-1 | 2 | | | | | | | | | | 1.17 m |
| 1.0 | | | | | CF-2 | 73 | w | | 2-3-5 8-13 | 8 | | | | | | | | | | |
| 1.52 | 8.43 | | Socle rocheux: Mudstone altéré et friable | | CF-3 | 63 | | | 24-36 50/11cm | R | | | | | | | | | | |
| 2.0 | 1.93 | | Fin du forage | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-13

| | | |
|---|---|--|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325833.0 | Date : 2014-01-15 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | Y : 5411684.0 | Profondeur (m) : 1.36 |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | Plan de localisation : Q025238-A1-2 |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS |
| Calibre du carottier : | CF(E) - Cuillère fendue (Environnement) | |
| Type de marteau : Mécanique | CR(E) - Carottier diamanté | |
| Rapport d'énergie : | TA(E) - Tarière | |
| Date (début) : 2015-01-14 | TEE - Tube Échantillonnage Environnement | |
| Date (fin) : 2015-01-15 | TM - Tube à paroi mince | |
| | VR(E) - Vrac | |
| | ÉTAT ÉCHANTILLON | |
| | <input checked="" type="checkbox"/> Remanié | AG: analyse granulométrique |
| | <input checked="" type="checkbox"/> Intact | SD: analyse sédimentométrique |
| | <input type="checkbox"/> Forage au diamant | W _L : limite liquide |
| | <input checked="" type="checkbox"/> Perdu | W _p : limite plastique |
| | | w : teneur en eau |
| | | C _u : cisaillement non drainé |
| | | S _r : sensibilité |
| | | Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|-------------------------|----------------------|---|----|----|----|----|----|----|----|----|----|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| | | | | | | | | | | | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 0,0 | 10.42 | | Surface du sol | | | | | | | | | | | | | | | | | |
| 0.15 | 10.27 | | Sol naturel: Tourbe Sable silteux, un peu de gravier, très lâche | | CF-1 | 40 | w | | 2-2-2 2-3 | 4 | | | | | | | | | | |
| 0.76 | 9.66 | | Sable graveleux et silteux, lâche | | CF-2 | 40 | AG - w | | 3-3-4 4-5 | 7 | | | | | | | | | | |
| 1.52 | 8.90 | | Socle rocheux: Mudstone altéré et friable | | CF-3 | 81 | | | 6-23 31-48 50/8cm | R | | | | | | | | | | |
| 2.21 | 8.21 | | Fin du forage | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-14

| | | |
|--|--|--|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325858.0 Y : 5411780.0 Z : 11.92 | Date : 2014-01-15 Profondeur (m) : 1.42 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: G. Bérubé | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Conventionnel | TYPE ÉCHANTILLON | ESSAIS RÉALISÉS |
| Calibre du carottier : Type de marteau : Mécanique Rapport d'énergie : Date (début) : 2015-01-14 Date (fin) : 2015-01-15 | CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | |
| | ÉTAT ÉCHANTILLON | |
| | <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input checked="" type="checkbox"/> Perdu | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--------------|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ◻ Limites d'Atterberg (%) ◻ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 11.92 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | Niveau d'eau | | | | | | | | |
| 0.15 | 11.77 | | Sol naturel: Tourbe Sable silteux, un peu de gravier, très lâche | | CF-1 | 33 | w | | 2-2-2 2-3 | 4 | | | | | | | | | | |
| 0.76 | 11.16 | | Sable et gravier, un peu de silt, lâche | | CF-2 | 40 | w | | 3-3-3 2-3 | 6 | | | | | | | | | | |
| 1.52 | 10.40 | | Socle rocheux: Mudstone altéré et friable | | CF-3 | 67 | | | 4-4-18 13-18 | 22 | | | | | | | | | | |
| 2.57 | 9.35 | | Fin du forage | | CF-4 | 100 | | | 24 78/13cm | R | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPEC SOL 2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: **F-2-15**

| | | |
|--|--|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU Date : Profondeur (m) : |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325881.0 Y : 5411873.0 Z : 10.84 | |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. |
| Type de forage : Tarière Calibre du carottier : NQ Type de marteau : Rapport d'énergie : Date (début) : 2014-12-07 Date (fin) : 2014-12-07 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input checked="" type="checkbox"/> Perdu |
| ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé | | |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|---|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------------------|---|--|--|--|--|--|--|--|--|--|--------------|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | | Niveau d'eau |
| 0,0 | 10.84 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | | | | | | | | | | |
| | | | Remblai: Sable silteux, traces de gravier, lâche (sol gelé jusqu'à 0,76m) | | CF-1 | 67 | | | 50/15cm | R | | | | | | | | | | | |
| 1.0 | | | | | CF-2 | 33 | AG | | 3-4-3 5-7 | 7 | | | | | | | | | | | |
| 2.0 | | | | | CF-3 | 63 | | | 3-4-4 7-6 | 8 | | | | | | | | | | | |
| 2.29 | 8.55 | | Sol naturel probable: Sable et gravier, un peu de silt, brun, très dense, saturé | | CF-4 | 100 | | | 19 50/3cm | R | | | | | | | | | | | |
| 3.0 | | | | | CF-5 | 50 | | | 28-50-63 50/0cm | 113 | | | | | | | | | | | |
| 3.51 | 7.33 | | Socle rocheux: Mudstone gris, de très mauvaise qualité | | CR-6 | 53 | | | | 11 | | | | | | | | | | | |
| 5.0 | 5.08 | | Fin du forage | | | | | | | | | | | | | | | | | | |
| 5.76 | | | | | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPEC SOL 2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-16

| | | |
|---|---|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325886.0 Y : 5411971.0 Z : 7.99 | Date : 2015-01-12 Profondeur (m) : 1.31 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Tarière Calibre du carottier : NQ Type de marteau : Rapport d'énergie : Date (début) : 2014-12-07 Date (fin) : 2014-12-07 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu |
| | | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--------------|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 7.99 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | Niveau d'eau | | | | | | | | |
| | | | Remblai: Sable graveleux, un peu de silt, brun (gelé jusqu'à 0,30m), présence de béton bitumineux | | CF-1 | 67 | AG | | 37-52-14 10-8 | 66 | | | | | | | | | | |
| 1.0 | 7.23 | | Remblai: Silt, un peu de sable et de gravier, brun, lâche | | CF-2 | 40 | | | 7-7-2 1-3 | 9 | | | | | | | | | | |
| 1.52 | 6.47 | | Sol naturel: Sable et gravier, un peu de silt, lâche, saturé | | CF-3 | 30 | | | 5-3-5 7-9 | 8 | | | | | | | | | | |
| | | | | | CF-4 | | | | -- | | | | | | | | | | | |
| 3.0 | 5.12 | | Socle rocheux: Mudstone gris, de mauvaise qualité | | CR-5 | 85 | | | | 36 | | | | | | | | | | |
| 4.0 | 3.88 | | Fin du forage | | CR-6 | 100 | | | | 33 | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-17

| | | |
|---|---|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325880.0 Y : 5412066.0 Z : 6.73 | Date : 2015-01-12 Profondeur (m) : 1.58 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Tarière Calibre du carottier : NQ Type de marteau : Rapport d'énergie : Date (début) : 2014-12-07 Date (fin) : 2014-12-07 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu |
| | | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------|---|--------------|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ○ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 6.73 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | Niveau d'eau | | | | | | | | |
| | | | Remblai: Sable graveleux et silteux, brun, compact (sol gelé jusqu'à 0,46m), présence de béton bitumineux | | CF-1 | 80 | AG | | 42-75-27 27-30 | 102 | | | | | | | | | | |
| 1.0 | | | | | CF-2 | 47 | | | 17-14-9 14-22 | 23 | | | | | | | | | | |
| 1.52 | 5.21 | | Sol naturel: Terre noire et morceaux de bois | | | | | | | | | | | | | | | | | |
| 1.72 | 5.01 | | Sable et gravier, un peu de silt, gris-brun, lâche | | CF-3 | 67 | | | 2-3-4 4-5 | 7 | | | | | | | | | | |
| 2.0 | | | | | CF-4 | 70 | | | 5-4-3 8-16 | 7 | | | | | | | | | | |
| 2.82 | 3.91 | | Socle rocheux: Mudstone très altéré, noir-verdâtre, de très mauvaise qualité | | CF-5 | 70 | | | 9-10-7 R/13cm | 17 | | | | | | | | | | |
| 3.63 | 3.10 | | Fin du forage | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations



RAPPORT DE FORAGE

FORAGE No: F-2-18

| | | |
|---|---|---|
| CLIENT: Parcs Canada | COORDONNÉES GÉODÉSQUES (MTM, NAD-83) (m) | ▼ - NIVEAU D'EAU |
| PROJET: Étude pédologique et géologique - Phase 2 - Route 132 | X : 325857.0 Y : 5412142.0 Z : 6.15 | Date : 2015-01-12 Profondeur (m) : 1.4 |
| LOCALISATION: Parc Forillon, Gaspé (Québec) | | Plan de localisation : Q025238-A1-2 |
| DÉCRIT PAR: É. Harrison | VÉRIFIÉ PAR: G. Dionne, ing., M. Sc. | |
| Type de forage : Tarière Calibre du carottier : NQ Type de marteau : Rapport d'énergie : Date (début) : 2014-12-07 Date (fin) : 2014-12-07 | TYPE ÉCHANTILLON CF(E) - Cuillère fendue (Environnement) CR(E) - Carottier diamanté TA(E) - Tarière TEE - Tube Échantillonnage Environnement TM - Tube à paroi mince VR(E) - Vrac | ÉTAT ÉCHANTILLON <input checked="" type="checkbox"/> Remanié <input checked="" type="checkbox"/> Intact <input type="checkbox"/> Forage au diamant <input type="checkbox"/> Perdu |
| | | ESSAIS RÉALISÉS AG: analyse granulométrique SD: analyse sédimentométrique W _L : limite liquide W _p : limite plastique w : teneur en eau C _u : cisaillement non drainé S _r : sensibilité Dup: éch. duplicata prélevé |

| COUPE STRATIGRAPHIQUE | | | | ÉCHANTILLON | | | | | | RÉSULTATS DES ESSAIS | | | | | | | | | | |
|-----------------------|---------------|---------|--|-------------|--------------------------|----------------|---------------|-----------|------------------------|----------------------|---|--------------|--|--|--|--|--|--|--|--|
| Profondeur (m) | Élévation (m) | Symbole | Stratigraphie | État | Type et Numéro (calibre) | Récupération % | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm | N ou RQD | ○ Teneur en eau (%) △ C _u (Terrain, kPa) ▭ Limites d'Atterberg (%) □ C _u (Lab, kPa) ● Indice "N" standard ▲ Indice "N _c " dynamique | | | | | | | | | |
| 0,0 | 6.15 | | Surface du sol | | | | | | | | 10 20 30 40 50 60 70 80 90 | Niveau d'eau | | | | | | | | |
| | | | Remblai: Sable graveleux, un peu de silt (sol gelé jusqu'à 0,30m), présence de béton bitumineux | | CF-1 | 53 | AG | | 25-34-12 9-8 | 46 | | | | | | | | | | |
| 1.0 | 5.39 | | Sol naturel: Sable et gravier, un peu de silt, brun, lâche à compact | | CF-2 | 40 | | | 4-4-3 4-4 | 7 | | | | | | | | | | |
| | 4.63 | | Devenant saturé | | CF-3 | 57 | | | 3-7-5 4-6 | 12 | | | | | | | | | | |
| 2.0 | | | | | CF-4 | 82 | | | 4-10-33 50/7cm | 43 | | | | | | | | | | |
| 3.0 | 2.82 | | Fin du forage Refus sur roc probable | | | | | | | | | | | | | | | | | |

FRANÇAIS - FORAGES METRES Q025238-A1-F-2.GPJ INSPECSOL2009.GDT 3-4-15

Voir la note explicative ci-jointe pour la liste complète des symboles et abréviations

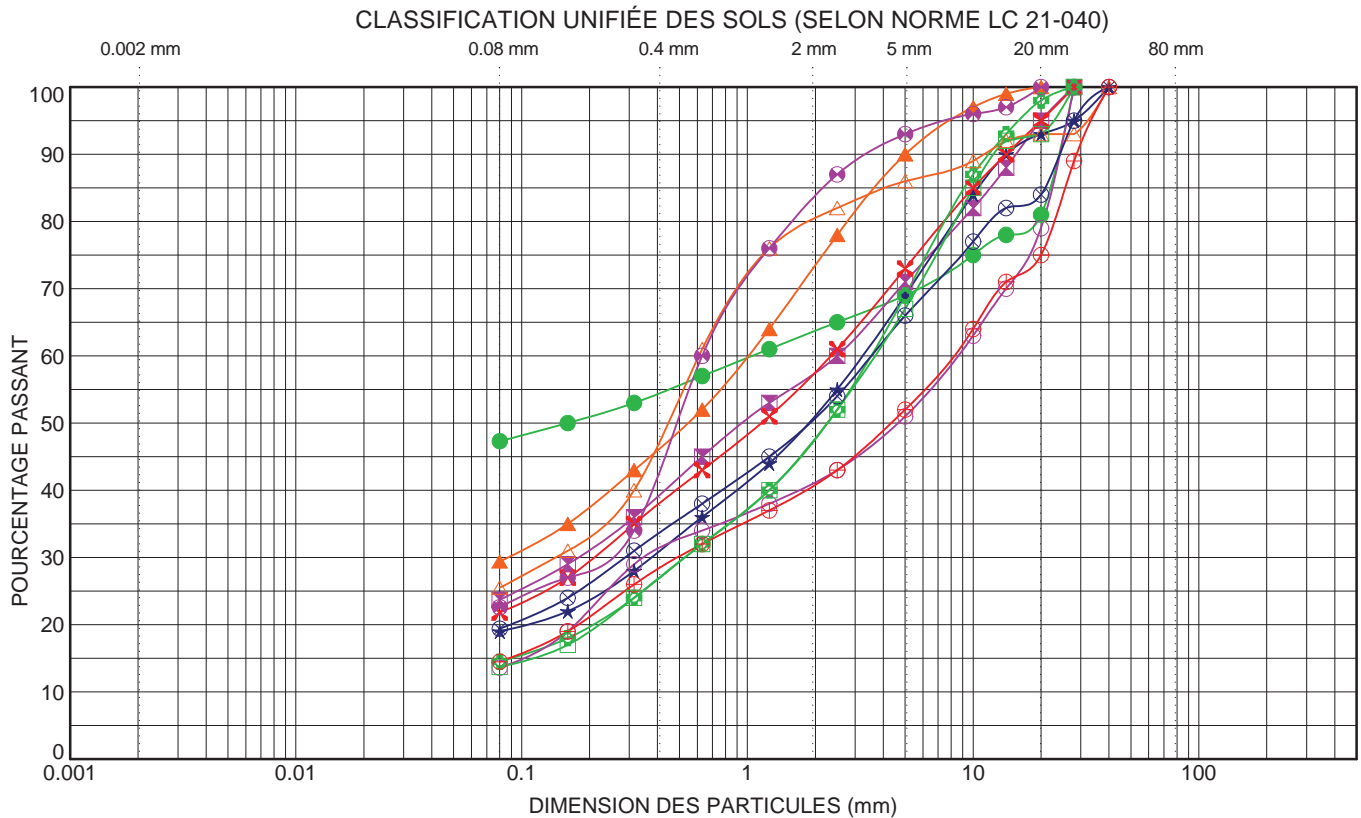
NUMÉRO DE PROJET : Q025238-A1

CLIENT : Parcs Canada

LOCALISATION : Parc Forillon, Gaspé (Québec)

NOM DU PROJET : Étude pédologique et géologique - Phase 2 - Route 132

DATE : 2015-03-03



| | | | | | | | |
|--------|------|-------|-------|----------|---------|----------|-------------------|
| ARGILE | SILT | SABLE | | | GRAVIER | | CAILLOUX ET BLOCS |
| | | fin | moyen | grossier | fin | grossier | |

| | Sondage no | Échantillon no | Profondeur (m) | Description | w (%) | W _L (%) | I _p (%) | Classification (1) |
|---|------------|----------------|----------------|----------------------------------|-------|--------------------|--------------------|--------------------|
| ● | F-2-10 | CF-2 | 0.76 | Silt graveleux et sableux | 20 | | | |
| ⊠ | F-2-13 | CF-2 | 0.76 | Sable graveleux et silteux | 20 | | | |
| ▲ | F-2-15 | CF-2 | 0.76 | Sable silteux, traces de gravier | | | | |
| ★ | F-2-16 | CF-1 | 0.00 | Sable graveleux, un peu de silt | | | | |
| ⊗ | F-2-17 | CF-1 | 0.00 | Sable graveleux et silteux | | | | |
| ⊕ | F-2-18 | CF-1 | 0.00 | Sable graveleux, un peu de silt | | | | |
| ○ | F-2-3 | CF-1 | 0.00 | Gravier et sable, un peu de silt | | | | |
| △ | F-2-3 | CF-2 | 0.76 | Sable silteux, un peu de gravier | | | | |
| ⊗ | F-2-4 | CF-1 | 0.00 | Sable graveleux, un peu de silt | | | | |
| ⊕ | F-2-4 | CF-2 | 0.76 | Gravier et sable, un peu de silt | | | | |
| □ | F-2-5 | CF-1 | 0.00 | Sable graveleux, un peu de silt | | | | |
| ⊕ | F-2-6 | CF-2 | 0.76 | Sable silteux, traces de gravier | | | | |

(1)

Préparé par : P. Leblond

Vérifié par : G. Dionne, ing., M. Sc.

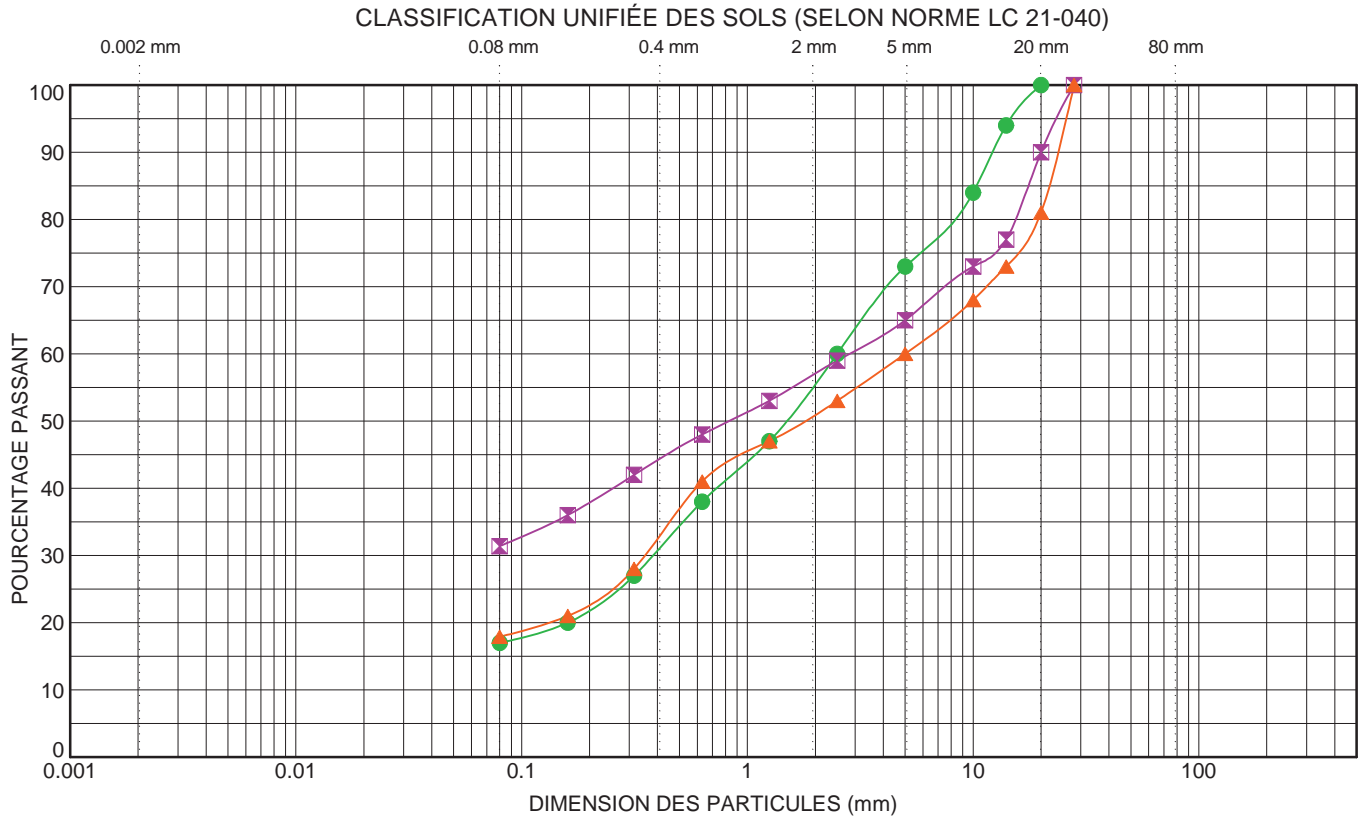
NUMÉRO DE PROJET : Q025238-A1

CLIENT : Parcs Canada

LOCALISATION : Parc Forillon, Gaspé (Québec)

NOM DU PROJET : Étude pédologique et géologique - Phase 2 - Route 132

DATE : 2015-01-23



| | | | | | | | |
|--------|------|-------|-------|----------|---------|----------|-------------------|
| ARGILE | SILT | SABLE | | | GRAVIER | | CAILLOUX ET BLOCS |
| | | fin | moyen | grossier | fin | grossier | |

| Sondage no | Échantillon no | Profondeur (m) | Description | w (%) | W _L (%) | I _p (%) | Classification (1) |
|------------|----------------|----------------|-------------|----------------------------------|--------------------|--------------------|--------------------|
| ● | F-2-7 | CF-2 | 0.76 | Sable graveleux, un peu de silt | 26 | | |
| ◻ | F-2-8 | CF-2 | 0.76 | Gravier sableux et silteux | 12 | | |
| ▲ | F-2-9 | CF-2 | 0.76 | Sable et gravier, un peu de silt | 14 | | |
| | | | | | | | |
| | | | | | | | |
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(1)

Préparé par : S. Pelletier

Vérifié par : G. Dionne, ing., M. Sc.

Annexe 3

- ◆ Photographies

PARCS CANADA
Étude pédologique
Phase 2, route 132
Parc Forillon, Gaspé (Québec)

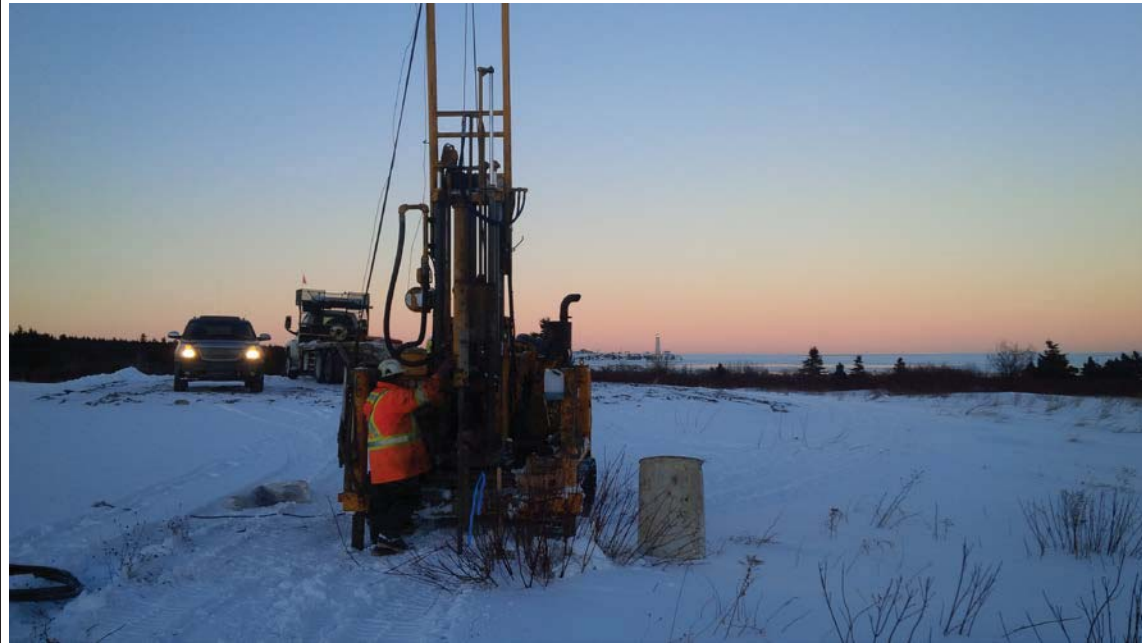


Photo no 1 : Forage F-2-14



Photo no 2 : Forage F-2-9

Annexe 4

- ◆ Résultats « Chaussée 2 »

Données générales**Nationale, DJMA inférieur à 5000 ; 0,263 millions d'ÉCAS (25 ans)****Climat de Gaspé a :** Zone Nord (17,5°C) ; Tma = 3,1°C ; IGn = 1113°C·jrs (écart type =14%)**BB :****Bibliothèque :** C:\Program Files (x86)\CHAUSSEE2\CHAUSSEE2.mdb

| No | Épaisseur (H) | | Matériau | Coût unitaire | Coût (\$ / m ²) |
|--------------------|---------------|----------------------|-------------------------------------|---------------|--------------------------------|
| | (mm) | (kg/m ²) | | | |
| 1 | 120 | 282 | BB | 60.00\$/tonne | 16,92 |
| 2 | 200 | 458 | MG 20 | 19.00\$/m3 | 3,80 |
| 3 | 600 | 1 244 | MG 112 (fuseau entier) | 9.00\$/m3 | 5,40 |
| 8 | | | SM fin (plus de 30 % passant 80 µm) | 7.00\$/m3 | |
| Total : 920 | | | | | 26,12 |

Analyse du trafic**DJMA comptage (2015) :** 640**DJMA initial (2016) :** 653**DJMA projeté (moyenne sur 25 ans) :** 836**g :** 2,0 % de croissance annuelle $fa = [(1 + g)^n - 1] / g$: 32,03**VL :** 7,0 % de camions (DJMA projeté corrigé : 836)**CAM :** 1,20 (Valeur par défaut)**N :** 300 jours / an**Trafic lourd :** 0,263 millions d'ECAS

(0,011 par année) Route à faible trafic

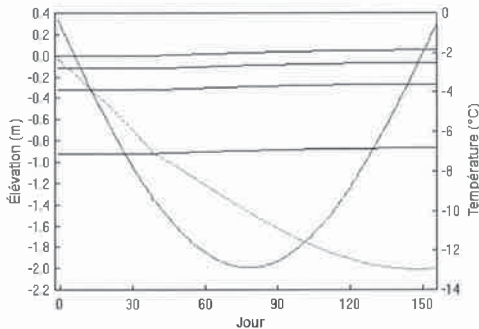
Répartition du trafic lourd (1 voies par direction)

| No Voie | Voie (%) | FS | ECAS par voie (en millions) | Sélection |
|---------|----------|-----|--------------------------------|-----------|
| 1 | 100.0 | 1.0 | 0.263 | |
| 2 | 100.0 | 1.0 | 0.263 | |

Analyse structurale (méthode AASHTO 1993)**ΔPSI :** 2,00 (4,25 - 2,25) **So :** 0,45 **R :** 80 % (Zr = -0,841) 0,263 millions d'ÉCAS

| No | H (mm) | FAS effectif/normal | Mr (MPa) | Ka | Kb | a | m | SN | W18 (millions d'ÉCAS) | Ok ? |
|----|-----------|------------------------|---------------------------------------|-------|-------|-------|------|------|--------------------------|------|
| 1 | 120 | 0.00 | $10^{(4.06-0.029 \cdot T)} = 3536$ | 0,414 | 1,896 | 0,468 | 1,00 | 2,21 | 1,712 | OUI |
| 2 | 200 | 0.94 | $13.6 \cdot \text{Theta}^{0.6} = 169$ | 0,249 | 0,977 | 0,116 | 0,80 | 2,94 | 1,480 | OUI |
| 3 | 600 | 0.90 | $6.9 \cdot \text{Theta}^{0.6} = 74$ | 0,227 | 0,839 | 0,075 | 0,80 | 4,36 | 6,384 | OUI |
| 8 | | 0.65 | 45 | | | | | | | |

Gel (Profondeur et soulèvements)



IG = 1326 °C·jrs (Récurrence aux 12 ans)

IGs = IG = 1326°C·jrs

G initial = 8.4°C/m (auto)(Univ. Laval)

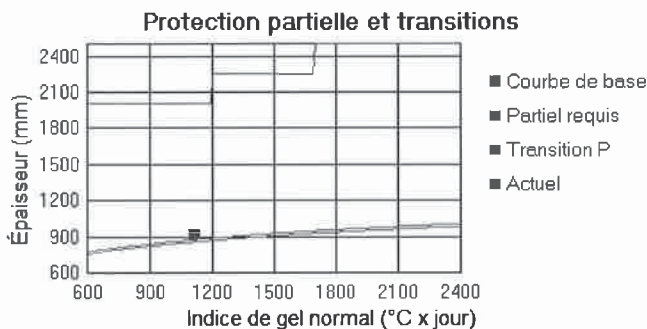
Soulèvement admis : 0,055 m

Pénétration du gel : 2,058 m

Soulèvement : 0,052 m (ok)

| No | H (mm) | ρd (t / m³) | ρs | n | Eau | Sr (%) | Sr Critique | SPo (mm²/KH) | a (MPa ⁻¹) | Ss (m²/g) | Wu (%) | Ks | Ku (W/mK) | Kf | Lf (WH/m³) |
|----|--------|-------------|------|------|------|--------|-------------|--------------|------------------------|-----------|--------|------|-----------|------|------------|
| 1 | 120 | 2,350 | 2.65 | 4,9 | 0,0 | 0,0 | 85 | 0,0 | 15,0 | 0.1 | 0.0 | 2.50 | 1,48 | 1,48 | 1 250 |
| 2 | 200 | 2,200 | 2.65 | 17,0 | 4,0 | 51,8 | 85 | 0,0 | 15,0 | 0.5 | 0.0 | 2.50 | 1,77 | 1,89 | 7 897 |
| 3 | 600 | 1,920 | 2.65 | 27,5 | 8,0 | 55,8 | 85 | 0,0 | 15,0 | 0.5 | 0.0 | 4.00 | 2,10 | 2,49 | 14 018 |
| 8 | | 1,800 | 2.69 | 33,1 | 15,0 | 81,6 | 85 | 4,0 | 11,0 | 10.0 | 0.0 | 3.50 | 1,85 | 0,00 | 21 802 |

Gel (Règle d'expérience de 1994)



Épaisseur totale de chaussée requise

Protection partielle (sol homogène):

$$HR = H_{base} \cdot F_{roule} \cdot F_{sol} \cdot F_{ponderation}$$

$$HR = 876 \cdot 1 \cdot 1.15 \cdot 0.85 = 856 \text{ mm}$$

Profondeur P (transitions gélif / non-gélif) = 2000 mm

Épaisseur actuelle = 920 mm [ok]

Attention aux différentiels de gélivité, appliquer les transitions au besoin.

Il est recommandé de vérifier les soulèvements au gel.

Avertissements

1 - MG 112 (fuseau entier)

Une sous-fondation de sable classifié SP devrait toujours être surmontée d'une fondation granulaire d'au moins 200 mm d'épaisseur.

Le concepteur doit considérer qu'un sable SP n'offrira pas une surface de roulement stable durant les travaux. L'ajout d'une couche de roulement composée d'un matériau plus pierreux pourrait dans ce cas s'avérer requise pour circuler sans problème.

Le "guide d'utilisation des géosynthétiques de séparation et de renforcement des chaussées" décrit la méthode de conception préconisée pour une structure de chaussée à surface granulaire.

Section D Plans