



Travaux publics et  
Services gouvernementaux  
Canada

Public Works and  
Government Services  
Canada

## ENLARGEMENT OF THE CAR PARK CANMETÉNERGIE - VARENNES

**SPECIFICATIONS  
ISSUED FOR TENDER**

*Not be used  
for construction*

R.076824.100

September 2, 2015

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<b>PUBLIC WORKS AND GOVERNMENT SERVICES CANADA</b> ENLARGEMENT OF THE CAR PARK CANMETÉNERGIE - VARENNES R.076824.100		<b>SECTION 00 01 10.01</b>  <b>CIVIL</b> <b>LIST OF SECTIONS</b>  Page 1	Drawings and Specs issued (50%) for approval	Issued for Tender															
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## **1. General**

### **.1 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises enlargement of the car park at canmetÉnergie group located at the 1615, bvd Lionel-Boulet, Varennes. Works include lighting work and the addition of a dual charging station for electric vehicles.

### **.2 PERIOD OF WORK**

- .1 Electrical work and civil construction will have a maximum of 45 calendar days .
- .2 The prices reported should include carrying out the work in winter conditions.
- .3 It is possible that part of the work is conducted in spring 2016. Prices given should reflect this reality.
- .4 The Contractor shall provide a timeline before work begins and update every week.

### **.3 WORK BY OTHERS**

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Department Representative.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to [Consultant], in writing, any defects which may interfere with proper execution of Work.

### **.4 WORK SEQUENCE**

- .1 Construct Work in stages to accommodate Owner's continued intermittent use of premises during construction.
- .2 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .3 Maintain fire access/control.
- .4 The contractor must take account of the regulation of Varennes Fire Department regarding the release of the main access roads to the building

### **.5 CONTRACTOR USE OF PREMISES**

- .1 Unrestricted use of site until Substantial Performance.

- .2 Limit use of premises for Work to allow:
  - .1 Owner occupancy.
  - .2 Partial owner occupancy.
  - .3 Work by other contractors.
  - .4 Public usage.
- .3 Co-ordinate use of premises under direction of Departmental Representative.
- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .7 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

**.6 OWNER OCCUPANCY**

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

**.7 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Permit from the City of Varennes . The Contractor shall be responsible for producing and coordinating the permit application and to pay the costs.
  - .2 Contract Drawings.
  - .3 Specifications.
  - .4 Addenda.
  - .5 Reviewed Shop Drawings.
  - .6 List of Outstanding Shop Drawings.
  - .7 Change Orders.
  - .8 Other Modifications to Contract.
  - .9 Field Test Reports.
  - .10 Copy of Approved Work Schedule.
  - .11 Health and Safety Plan and Other Safety Related Documents.
  - .12 Other documents as specified.

**2. Products**

.1 **NOT USED**

.1 Not used.

**3. Execution**

.1 **NOT USED**

.1 Not used.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 03 30 00.01 – Cast in place concrete (short form);
- .2 Section 26 05 20 - Wire and Box Connectors 0 – 1,000 V;
- .3 Section 26 05 21 - Wires and Cables (0 – 1,000 V);
- .4 Section 26 05 28 - Grounding – Secondary;
- .5 Section 26 05 29 - Hangers and Supports for Electrical Systems;
- .6 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets;
- .7 Section 26 05 34 - Conduits, Conduit Fastenings and Fittings;
- .8 Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts;
- .9 Section 26 28 16.02 - Moulded Case Circuit Breakers
- .10 Section 26 56 19 - Roadway Lighting
- .11 Section 32 11 23 – Aggregate base course;
- .12 Section 31 00 99 – Earthwork for minor works;
- .13 Section 31 05 16 - Aggregate materials;
- .14 Section 31 24 13 – Roadway embankments;
- .15 Section 31 32 19.01 – Geotextiles;
- .16 Section 31 37 00 – Rip rap;
- .17 Section 32 11 16.01 – Granular sub-base;
- .18 Section 32 12 16.01 – Asphalt paving (short form);
- .19 Section 32 16 15 – Concrete walk, curbs and gutters;
- .20 Section 32 17 23 – Pavement marking;
- .21 Section 32 92 23 – Sodding;
- .22 Section 33 41 00 – Storm utility drainage piping;
- .23 Section 33 65 76 - Direct Buried Underground Cable Ducts.

### .2 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.



- .2 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 Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

**.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 5 days for Departmental Representative's review of each submission.

- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.

- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit one (1) electronic copie of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit one (1) electronic copie of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit one (1) electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit one (1) electronic copie of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit one (1) electronic copie of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit one (1) electronic copie of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.

- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with 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.

**.4 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

**2. Products**

- .1 **NOT USED**
  - .1 Not Used.

**3. Execution**

- .1 **NOT USED**
  - .1 Not Used.

**END OF SECTION**

## 1. General

### .1 REFERENCES

- .1 Code canadien du travail, partie II, Règlement canadien sur la sécurité et la santé au travail
- .2 Province de Québec
  - .1 Loi sur la santé et la sécurité du travail, L.R.Q., c. S-2.1 (édition en vigueur) - Mise à jour 2005.

### .2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to weekly Departmental Representative.
- .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 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 2 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative] within 2 days after receipt of comments from Departmental Representative.
- .7 Departmental 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
- .8 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 Departmental Representative.

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

**.3 FILING OF NOTICE**

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

**.4 SAFETY ASSESSMENT**

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

**.5 MEETINGS**

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

**.6 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

**.7 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 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**.8 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
- .4 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

**.9 COMPLIANCE REQUIREMENTS**

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

**.10 UNFORSEEN HAZARDS**

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

**.11 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 CSST having jurisdiction, and in consultation with Departmental Representative.

**.12 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.



- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

**.13 WORK STOPPAGE**

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

**2. Products**

**.1 NOT USED**

- .1 Not used.

**3. Execution**

**.1 NOT USED**

- .1 Not used.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 14 13 – Soil stripping and stockpiling
- .2 Section 31 23 33.01 Excavating, trenching and backfilling

### .2 REFERENCES

- .1 Definitions:
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
- .2 Reference Standards:
  - .1 Canadian Construction Documents Committee (CCDC)
    - .1 CCDC 2-2008 Stipulated Price Contract.
  - .2 U.S. Environmental Protection Agency (EPA)/Office of Water
    - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
    - .2 EPA General Construction Permit (GCP) 2012.

### .3 FIRES

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

### .4 DRAINAGE

- .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations EPA 832/R-92-005, Chapter 3.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.

- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**.5 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated.

**.6 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Use waterway beds for borrow material only after written receipt of approval from Departmental Representative.
- .3 Waterways to be kept free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.

**.7 POLLUTION CONTROL**

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

**.8 NOTIFICATION**

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal

environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

- .1 Take action only after receipt of written approval by Departmental Representative.

- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

## **2. Products**

- .1 **NOT USED**

- .1 Not Used.

## **3. Execution**

- .1 **CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 03 30 00.01 – Cast in place concrete (short form);
- .2 Section 26 05 20 - Wire and Box Connectors 0 – 1,000 V;
- .3 Section 26 05 21 - Wires and Cables (0 – 1,000 V);
- .4 Section 26 05 28 - Grounding – Secondary;
- .5 Section 26 05 29 - Hangers and Supports for Electrical Systems;
- .6 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets;
- .7 Section 26 05 34 - Conduits, Conduit Fastenings and Fittings;
- .8 Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts;
- .9 Section 26 28 16.02 - Moulded Case Circuit Breakers
- .10 Section 26 56 19 - Roadway Lighting
- .11 Section 32 11 23 – Aggregate base course;
- .12 Section 31 00 99 – Earthwork for minor works;
- .13 Section 31 05 16 - Aggregate materials;
- .14 Section 31 24 13 – Roadway embankments;
- .15 Section 31 32 19.01 – Geotextiles;
- .16 Section 31 37 00 – Rip rap;
- .17 Section 32 11 16.01 – Granular sub-base;
- .18 Section 32 12 16.01 – Asphalt paving (short form);
- .19 Section 32 16 15 – Concrete walk, curbs and gutters;
- .20 Section 32 17 23 – Pavement marking;
- .21 Section 32 92 23 – Sodding;
- .22 Section 33 41 00 – Storm utility drainage piping;
- .23 Section 33 65 76 - Direct Buried Underground Cable Ducts.

### .2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled. Do not burn waste materials on site.

- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Dispose of waste materials and debris off site.
- .6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .11 At the request of the Departmental Representative to clean paved surfaces using a brush truck and / or a sprinkler truck.

**.3 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .11 Remove dirt and other disfiguration from exterior surfaces.
- .12 Sweep and wash clean paved areas.
- .13 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .14 Clean roofs, downspouts, and drainage systems.
- .15 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .16 Remove snow and ice from access to building.
- .17 Clean paved surfaces using a brush truck and / or a sprinkler truck.

**.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling.

**2. Products**

**.1 NOT USED**

- .1 Not Used.

**3. Execution**

**.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 32 16 15 – Concrete walk, curbs and gutters

### .2 REFERENCES

- .1 ASTM International
  - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .2 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
  - .3 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International
  - .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.
- .4 Gouvernement du Québec
  - .1 BNQ 1809-500/2006, Bureau de Normalisation du Québec, Travaux de construction-Trottoirs et bordures en béton.
  - .2 MTQ, Norme 3101 du Ministère du Transport du Québec Tome VII, Matériaux, chapitre 3, Bétons et Produits connexes.

### .3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
- .3 At least 4 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.



- .1 Do not change source of fly ash without written approval of Departmental Representative.

#### .4 **QUALITY ASSURANCE**

- .1 Provide to Departmental Representative 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
  - .1 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements.
  - .2 Sustainability Standards Certification:
    - .1 Construction Waste Management: provide copy of plan.
    - .2 Recycled Content:
      - .1 Provide listing of recycled content products used.
      - .2 When Supplementary Cementing Materials (SCMs) are used, provide evidence to certify [reduction in cement from Base Mix to Actual SCMs Mix, as percentage].

#### .5 **DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative 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. Products**

#### .1 **DESIGN CRITERIA**

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

**.2 PERFORMANCE CRITERIA**

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

**.3 MATERIALS**

- .1 Cement: to CSA A3001, Type GU and MTQ 3103.
- .2 Hydraulic cement: Type GUb to CSA A3001.
- .3 Supplementary cementing materials: with minimum 20% Type F by mass of total cementitious materials to CSA A3001.
- .4 Water: to CSA A23.1/A23.2.
- .5 Premoulded joint filler:
  - .1 Bituminous impregnated fibreboard: to [ASTM D1751].
- .6 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .7 Other concrete materials: to CSA A23.1/A23.2.

**.4 MIXES**

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
  - .2 requirements:
    - .1 Compressive strength at 28 age: 35 MPa minimum.
    - .2 Intended application 390 kg/m<sup>3</sup>
    - .3 Aggregate size 5-20 mm. mm maximum.
    - .4 % water/ciment maximum : 0.40.
    - .5 Teneur en air : 5 à 8%.
    - .6 Affaissement : 30 ± 30 mm.
  - .3 Concrete supplier's certification.
  - .4 Provide quality management plan to ensure verification of concrete quality to specified performance.

### **3. Execution**

#### **.1 PREPARATION**

- .1 Provide Departmental Representative 24 hours notice before each concrete pour.
- .2 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .3 Protect previous Work from staining.
- .4 Clean and remove stains prior to application of concrete finishes.

#### **.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

#### **.3 FINISHES**

- .1 Formed surfaces exposed to view: [sack rubbed finish] in accordance with CSA A23.1/A23.2.

#### **.4 EXPANSION AND ISOLATION JOINTS**

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

#### **.5 CURING**

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

#### **.6 FIELD QUALITY CONTROL**

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated.

#### **.7 CLEANING**

- .1 Clean in accordance with Section 01 74 11 – Cleaning.
- .2 Designate cleaning area for tools to limit water use and runoff.
- .3 Cleaning of concrete equipment to be done in accordance with Section 01 35 43 Environmental Procedures.

**END OF SECTION**

## **1. General**

### **.1 RELATED REQUIREMENTS**

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

### **.2 REFERENCES**

#### **.1 Definitions:**

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

#### **.2 Reference Standards:**

##### **.1 CSA Group**

- .1 CSA C22.1, Canadian Electrical Code, Part 1 (last Edition), Safety Standard for Electrical Installations.
- .2 CSA C22.10, Quebec construction code, Chapter V, Electricity Canadian electrical code, Part 1 (21st edition) with Quebec amendments.
- .3 CAN/CSA-C22.3 No.1, Overhead Systems.
- .4 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

##### **.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)**

- .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

### **.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 charging station, lampposts, conduits and wiring as well as protective devices and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .2 Submit four (4) copies of drawings and product data.
- .3 If changes are required, notify Departmental Representative of these changes before they are made.

.4 Certificates:

- .1 Provide CSA certified material.
- .2 Where CSA certified material is not available, submit such material to inspection authorities for approval before delivery to site.
- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract.

.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data .
  - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

## 2. Products

### .1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English and in French.
- .4 Use one nameplate for both languages.

### .2 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

### .3 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
  - .1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, blackface, white core, mechanically attached with self tapping screws.
  - .2 Sizes as follows:

NAMEPLATE SIZES			
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters

- .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate.

.4 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.5 Terminal cabinets and pull boxes: indicate system and voltage.

.4 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

.5 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Prime	Auxiliary	
up to 250 V	Yellow	
up to 600 V	Yellow	Green

3. Execution

.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cables 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 and after receipt of written approval to proceed from Departmental Representative.

**.2 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

**.3 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

**.4 CONDUIT AND CABLE INSTALLATION**

- .1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

**.5 CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

**.6 FIELD QUALITY CONTROL**

- .1 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.



- .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance:
  - .1 Power distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
- .7 SYSTEM STARTUP
  - .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.
  - .2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.
- .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 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## **1. General**

### **.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 – Common Work Results for Electrical.

### **.2 REFERENCES**

#### **.1 CSA International**

- .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
- .2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

#### **.2 National Electrical Manufacturers Association (NEMA)**

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

### **.4 CLOSEOUT SUBMITTALS**

- .1 Submit the required documents/elements.

### **.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect wire and box connectors.
- .3 Replace defective or damaged materials with new.

## 2. Products

### .1 MATERIALS

- .1 Pressure type splicing connectors for conductors AWG 8 and larger: using uninsulated solderless compression connections, Burndy type, KPA and QA-B models, or equivalent, and covered with rubber splicing tape conforming to standards for this type of splice.
- .2 Fixture type splicing connectors, Elastimold type, for roadway lighting with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

## 3. Execution

### .1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors 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 and after receipt of written approval to proceed from Departmental Representative.

### .2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors [cables] and:
  - .1 Install mechanical pressure type connectors and tighten screws [with appropriate compression tool recommended by manufacturer]. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.

- .2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

**.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.

**END OF SECTION**

## **1. General**

### **.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 – Common Work Results for Electrical.

### **.2 REFERENCES**

#### **.1 CSA International**

- .1 CAN/CSA-C22.2 No.0.3, Test methods for electrical wires and cables.
- .2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

### **.3 PRODUCT DATA**

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

### **.4 DELIVERY, STORAGE AND HANDLING**

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

## **2. Products**

### **.1 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

- .2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE.

### 3. Execution

#### .1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform wires tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

#### .2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .3 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

#### .3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
  - .2 In underground ducts in accordance with Section 33 65 76 – Direct buried underground cable ducts.
  - .3 In surface in accordance with Section 26 05 34 – Conduits, conduit fastenings and conduit fittings.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical
- .2 Section 26 02 21 – Wires and Cables (0 - 1000 V)

### .2 REFERENCES

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE 837, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

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

### .4 CLOSEOUT SUBMITTALS

- .1 Submit the required documents/elements.

### .5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

## 2. Products

### .1 EQUIPMENT

- .1 Rod electrodes: galvanized steel 19 mm diameter by minimum 3 m long.
- .2 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .3 Insulated grounding conductors: green, copper conductors, size as indicated.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

## 3. Execution

### .1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment 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 and after receipt of written approval to proceed from Departmental Representative.

**.2 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Install separate ground conductor to outdoor lighting standards.

**.3 ELECTRODES**

- .1 Install rod electrodes and make grounding connections as indicated.
- .2 Bond separate, multiple electrodes together.
- .3 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

**.4 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections.

**.5 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. outdoor lighting, charging station.

**.6 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

**.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.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Electrical – Common Work Results For Electrical.

### .2 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 [hangers and supports] and include product characteristics, performance criteria, physical size, finish and limitations.

## 2. Products

### .1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted and suspended.

## 3. Execution

### .1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports 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 [and after receipt of written approval to proceed from Departmental Representative.

.2 INSTALLATION

- .1 Secure equipment to hollow and solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .6 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .9 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.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.

**END OF SECTION**

## **1. General**

### **.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - Electrical - Common Work Results for Electrical

### **.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1, Canadian Electrical Code, Part 1, last Edition.

### **.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **2. Products**

### **.1 JUNCTION AND PULL BOXES**

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

## **3. Execution**

### **.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 No junction and pull boxes are indicated. Install all pull boxes as required by CSA C22.1.

### **.2 IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name voltage and phase.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.

### .2 REFERENCES

- .1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45, Rigid Metal Conduit.
- .3 CSA C22.2 No. 83, Electrical Metallic Tubing.
- .4 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.

### .3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
  - .1 Submit conduit manufacturing data.
- .3 Quality assurance submittals:
  - .1 Test reports: submit certified test reports.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Instructions: submit manufacturer's installation instructions.

## 2. Products

### .1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Rigid PVC conduit: to CSA C22.2 No. 211.2.

### .2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
  - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

### .3 CONDUIT FITTINGS

- .1 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .2 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

### .4 FISH CORD

- .1 Polypropylene.

## 3. Execution

### .1 MANUFACTURER'S INSTRUCTIONS

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



**.2 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms or in unfinished areas.
- .3 Use rigid aluminum threaded conduit except where specified otherwise.
- .4 Use electrical metallic tubing (EMT) inside.
- .5 Use rigid PVC conduit underground.
- .6 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 19 mm diameter.
- .8 Install fish cord in empty conduits.
- .9 Dry conduits out before installing wire.

**.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible on suspended or surface channels.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

**.4 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

**.5 CONDUITS UNDERGROUND**

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

**.6 CLEANING**

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

## **1. General**

### **.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - Electrical - Common Work Results for Electrical.
- .2 Section 33 65 76 - Electrical - Direct Buried Underground Cable Ducts.

### **.2 REFERENCES**

- .1 Insulated Cable Engineers Association, Inc. (ICEA).

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

### **.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect cables from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **2. Execution**

### **.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable 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 and after receipt of written approval to proceed from Departmental Representative.

**.2 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

**.3 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
  - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.

- .4 Check each feeder for continuity, short circuits and grounds.
    - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
  - .5 Pre-acceptance tests:
    - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 500 V megger on each phase conductor.
    - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
  - .6 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
  - .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.
- .4 CLEANING
- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
    - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .5 PROTECTION
- .1 Repair damage to adjacent materials caused by cables installation.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Electrical – Common Work Results for Electrical.

### .2 REFERENCES

- .1 CSA International
  - .1 CSA C22.2 No. 5-13, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMJ-J-266-ANCE-2013).

### .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 circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Include time-current characteristic curves for breakers with interrupting capacity of 22,000 A symmetrical (RMS) and over at system voltage.

## 2. Products

### .1 BREAKERS GENERAL

- .1 Circuit breakers: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual operation.
- .3 Common-trip breakers: with single handle for multi-pole applications.

**.2 THERMAL MAGNETIC BREAKERS – DESIGN A**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

**3. Execution**

**.1 INSTALLATION**

- .1 Install circuit breakers.

**.2 CLEANING**

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

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 26 05 00.0 - Electrical – Common Work Results for Electrical.

### .2 REFERENCES

- .1 CSA Group
  - .1 CSA C22.2 No.206-13(C2013), Lighting Poles.

### .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 roadway lighting and include product characteristics, performance criteria, physical size, finish and limitations.

### .4 DELIVERY, STORAGE AND HANDLING

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



## 2. Products

### .1 STEEL POLES

#### .1 General

- .1 Steel pole: monotube, non tapered, square (102 mm x 102 mm), height of 9.1 m; 3 mm wall thickness minimum. Pole base must be welded to anchor footing.
- .2 Mounting on concrete anchor base.
- .3 Access handhole  $\pm 450$  mm above pole base for wiring connections, with welded-on reinforcing frames and bolted-on cover.
- .4 Anchor bolts (3/4-10): steel with shims, nuts and covers.
- .5 Anchor bolts shall have a cover.
- .6 Finish: electro-statically applied black polyester powder finish over a minimum thickness of 100  $\mu$ .
- .7 Ground lugs for 6 AWG wires located at access door height.
- .8 Counterweight system to eliminate resonance frequency.
- .9 Oblong holes for the pole's base shall accept a bolt circle varying from 35 mm (9.3 in.) to 279 mm (11 in.).
- .10 All poles shall be able to support wind loads as per the following:
  - .1 Resist 100 km/h winds with 140 km/h gust wind.
  - .2 Support two (2) luminaires.
  - .3 Maximum EPA to be used shall be 120 LED including accessories.

.2 LUMINAIRES

.1 General characteristics:

- .1 Luminaire with aluminium cast housing, LED light strip, weatherproof (IP66), black. Opening and closing system to access components shall be without tools.
- .2 Luminaire shall be cUL (or CSA) approved and dark-sky compliant and have undergone 3G vibration testing as per CALTrans 611 vibration testing, GR-63 CORE 4.4.1/5.4.2 Earthquake zone 4, or ANSI C136.31-2001. Test reports shall be available upon request.
- .3 Fixture must be equipped with overvoltage protection in compliance with standard IEEE / ANSI C62.41.2, and listed for test procedures LM-79 and LM-80.
- .4 Minimum warranty of ten (10) years for all components and all manufacturing and operating defects as well as a minimum 10-year warranty on corrosion-, ultraviolet- and abrasive-resistant luminaire finish.
- .5 All hardware shall be made of stainless steel.
- .6 Factory pre-wired luminaires with integral regulator.
- .7 Luminaire types are described below.

.2 LED fixture, L1 model:

- .1 Number of LED's: 60.
- .2 Type: designed for console installation.
- .3 Voltage: 120 VAC.
- .4 Dimensions: 688 mm long x 357 mm wide x 99 mm high.
- .5 Lamp: LED from CREE, 136 W, 8,167 lumens, 700 mA, 4,000°K colour temperature, minimum 70 colour rendering index (CRI) and minimum 61,000-hour service life at 700 mA.

- .6 Distribution: Type IV medium full cutoff with backlight shield.
- .7 Power supply: 120 VAC, plug-in type, LED power supply and driver circuit, class 1 with power factor greater than 90%, harmonic distortion rate (THD) less than 20% at full load. Circuit protected by 10 kV overvoltage suppressor in compliance with IEEE/ANSI C62.41.2. The regulator must be able to start at temperatures up to at least 40°C.
- .8 Ballast: black.
- .9 Option: fuse and control 0-10V.
- .10 Specified product: CREE, Edge model no. XAL-1-J-06-E-U-T-D-7-Y-F.

### 3. Execution

#### .1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for roadway lighting 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.

#### .2 INSTALLATION

- .1 Install poles true and plumb in accordance with manufacturer's instructions.
- .2 Install luminaires on pole.
- .3 Check luminaire orientation, level and tilt.

- .4 Connect luminaire to existing lighting circuit and control circuit.
- .5 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .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.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 05 16 – Aggregate materials
- .2 Section 31 14 13 – Soil stripping and stockpiling
- .3 Section 31 23 33.01 – Excavating, trenching and backfilling
- .4 Section 31 24 13 – Roadway embankments

### .2 REFERENCES

- .1 ASTM International
- .2 CSA International
  - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .3 Ministère des Transports du Québec
  - .1 Cahier des charges et devis généraux (CCDG) : infrastructures routières, Édition 2010.

### .3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Construction Waste Management:
    - .1 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 75% of construction wastes were recycled or salvaged.

## 2. Products

### .1 MATERIALS

- .1 Crushed Granular MG-20 and MG-56 CCDG, article 12 .
- .2 Unshrinkable fill: concrete to CSA A23.1/A23.2.

## 3. Execution

### .1 EXAMINATION

- .1 Verification of Conditions:

- .1 Examine soil report available at this document.
- .2 Before commencing work verify locations of buried services on and adjacent to site.
- .2 Evaluation and Assessment:
  - .1 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.
  - .2 Not later than 1 week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill material proposed for use.
  - .3 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative so that compaction tests can be carried out by designated testing agency.
  - .4 Before commencing work, conduct, with Departmental Representative, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

## **.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with requirements of authorities having jurisdiction, MDDELCC.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Protection of in-place conditions:
  - .1 Protect excavations from freezing.
  - .2 Keep excavations clean, free of standing water, and loose soil.
  - .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
  - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area

to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are to remain undisturbed.

.3 Removal:

.1 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

### .3 EXCAVATION

.1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.

.2 Topsoil stripping:

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Avoid mixing topsoil with subsoil.

.3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.

.4 Dispose of topsoil off site.

.3 Excavate as required to carry out work, in all materials met.

.1 Do not disturb soil or rock below bearing surfaces. Notify Departmental Representative when excavations are complete.

.2 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

.3 Fill excavation taken below depths shown without Departmental Representative's written authorization with concrete of same strength as for footings.

.4 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.

.5 Excavate for slabs and paving to subgrade levels.

.1 Remove topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

### .4 SITE QUALITY CONTROL

.1 Fill material and spaces to be filled to be inspected and approved by Departmental Representative.

**.5 BACKFILLING**

- .1 Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from Departmental Representative.
- .2 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .3 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with selected subgrade compacted as specified for fill.
- .4 Placing:
  - .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
  - .2 Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.
- .5 Compaction: compact each layer of material to following densities for material to ASTM D698:
  - .1 To underside of basecourses: 95%.
  - .2 Basecourses: 100%.
  - .3 Elsewhere: 90%.
- .6 In trenches:
  - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
  - .2 Over 300 mm above pipe or conduit: native material approved by Departmental Representative.
- .7 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

**.6 GRADING**

- .1 Grade to ensure that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative. Grade to be gradual between finished spot elevations as indicated.

**.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Dispose of cleared and grubbed material off site daily.



- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 03 30 00.02 – Cast in place concrete (short form)
- .2 Section 31 37 00- Rip rap
- .3 Section 32 11 16.01 – Granular sub-base
- .4 Section 32 11 23 – Aggregate base course
- .5 Section 32 12 16.01 – Asphalt paving (short form)

### .2 REFERENCES

- .1 ASTM International
  - .1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Gouvernement of Quebec
  - .1 CCDG-2013-12, Cahier des Charges et Devis Généraux, Fondations de chaussée.
  - .2 BNQ 2560-114/2007, Bureau de Normalisation du Québec. Granulats

### .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 [aggregate materials] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Allow continual sampling by Departmental Representative during production.
  - .2 Provide Departmental Representative with access to source and processed material for sampling.

### .4 DELIVERY, STORAGE AND HANDLING

- .1 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

## **2. Products**

### **.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
  - .2 Reclaimed asphalt pavement.
  - .3 Reclaimed concrete material.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
  - .3 Light weight aggregate, including slag and expanded shale.
  - .4 Reclaimed asphalt pavement.
  - .5 Reclaimed concrete material.

### **.2 SOURCE QUALITY CONTROL**

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative 4 weeks minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

### **3. Execution**

#### **.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Stockpiling:
  - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
  - .6 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

#### **.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Earthwork for minor works
- .2 Section 31 22 13 – Rough grading
- .3 Section 31 05 16 – Aggregate materials
- .4 Section 32 92 23 – Sodding.

### .2 REFERENCES

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

## 2. Products

### .1 NOT USED

- .1 Not Used.

## 3. Execution

### .1 STRIPPING OF TOPSOIL

- .1 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .2 Handle topsoil only when it is dry and warm.
- .3 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation.
- .4 Pile topsoil by mechanical hoe in berms in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 3 m.
- .5 Dispose of unused topsoil off-site in location as indicated by Departmental Representative.
- .6 Protect stockpiles from contamination and compaction.
- .7 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

**.2 PREPARATION OF GRADE**

- .1 Verify that grades are correct and notify Departmental Representative. Departmental Representative if discrepancies occur do not begin work until instructed by .
  - .1 Grade area only when soil is dry to lessen soil compaction.
  - .2 Grade soil with scrapers establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

**.3 PLACING OF TOPSOIL**

- .1 Place topsoil only after Departmental Representative has accepted subgrade.
- .2 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .3 Cultivate soil following spreading procedures.

**.4 CLEANING**

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

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 14 13 – Soil stripping and stockpiling
- .2 Section 31 24 13 – Roadway embankments
- .3 Section 32 92 23 - Sodding

### .2 REFERENCES

- .1 ASTM International
  - .1 ASTM D698-07e1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m<sup>3</sup>).
- .2 Underwriters' Laboratories of Canada (ULC)

### .3 EXISTING CONDITIONS

- .1 Examine subsurface investigation report which is [available for inspection at this document.
- .2 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3 Refer to dewatering in Section 31 23 33.01 - Excavating, Trenching and Backfilling.

## 2. Products

### .1 MATERIALS

- .1 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

## 3. Execution

### .1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for rough grading 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 after receipt of written approval to proceed from Departmental Representative.

**.2 STRIPPING OF TOPSOIL**

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.
- .2 Commence topsoil stripping of areas as indicated Departmental Representative after area has been cleared of grasses and removed from site.
- .3 Strip topsoil to depths as indicated Departmental Representative. Rototill weeds, grasses and retain as topsoil on site. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as indicated by Departmental Representative. Stockpile height not to exceed 2 m.
- .5 Dispose of unused topsoil off site.

**.3 GRADING**

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .3 Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as follows:
  - .1 85% under landscaped areas.
  - .2 95% under paved and walk areas.
- .4 Do not disturb soil within branch spread of trees or shrubs to remain.

**.4 TESTING**

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory designated.

**.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.

**.6 PROTECTION**

- .1 Protect and transplant existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, [surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.

**END OF SECTION**

## 1. General

### .1 RELATED SECTIONS

- .1 Section 31 24 13 – Roadway embankments.
- .2 Section 32 16 15 – Concrete walks, curbs and gutters.
- .3 Section 33 41 00 – Storm utility drainage piping.

### .2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-63/2007, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D1557-09, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft<sup>3</sup> ; (2,700 kN-m/m<sup>3</sup> ;).
  - .5 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-08, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .5 Quebec Government
  - .1 CCDG-2013-11, Cahier des Charges et Devis Généraux, Terrassements.

- .2 BNQ 1809-300/2009, Bureau de Normalisation du Québec.  
Drinking Water and Sewer Lines.

**.3 DEFINITIONS**

- .1 Excavation classes: two classes of excavation will be recognized;  
common excavation and rock excavation.
- .1 Rock: solid material in excess of 1.00 m ; and which cannot  
be removed by means of heavy duty mechanical excavating  
equipment. Frozen material not classified as rock.
- .2 Common excavation: excavation of materials of whatever  
nature, which are not included under definitions of rock  
excavation.
- .2 Unclassified excavation: excavation of deposits of whatever  
character encountered in Work.
- .3 Topsoil:
- .1 Material capable of supporting good vegetative growth and  
suitable for use in top dressing, landscaping and seeding.
- .2 Material reasonably free from subsoil, clay lumps, brush,  
objectionable weeds, and other litter, and free from cobbles,  
stumps, roots, and other objectionable material larger than 25  
millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or  
surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be  
graded, and required for construction of fill areas or for other  
portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from  
alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
- .1 Weak, chemically unstable, and compressible materials.
- .2 Frost susceptible materials:
- .1 Fine grained soils with plasticity index less than 10  
when tested to ASTM D4318, and gradation within  
limits specified when tested to ASTM D422 and  
ASTM C136: Sieve sizes to CAN/CGSB-8.2.
- .2 Table:

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

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

**.4 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
  - .2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.
  - .3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
  - .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
  - .5 Submit to Departmental Representative testing, inspection results and report as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
  - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
  - .4 At least 4 weeks prior to beginning Work, inform Departmental Representativev source of fly ash and submit samples to Depeartmental Representative.

- .1 Do not change source of Fly Ash without written approval of Departmental Representative.

**.5 GEOTECHNICAL STUDY**

- .1 The contractor shall perform excavation work, trenching and backfilling operations as recommended by the geotechnical study and preliminary environmental soil characterization report (Golder Associés – Juillet 2015) annexed.

**.6 QUALITY ASSURANCE**

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Quebec, Canada.
- .4 Keep design and supporting data on site.
- .5 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .6 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 41 00 – Regulatory Requirements.

**.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert excess aggregate materials from landfill to local quarry facility for reuse as directed by Departmental Representative.

**.8 EXISTING CONDITIONS**

- .1 Examine soil report available at quotation.
- .2 Buried services:
  - .1 Before commencing work have verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

- .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .5 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures.
- .6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods.
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .8 Record location of maintained, re-routed and abandoned underground lines.
- .9 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

## **2. Products**

### **.1 MATERIALS**

- .1 Type MG-20 and MG-56 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.
- .2 Backfill Class B: compactable inorganic materials selected from the excavated material or elsewhere, unfrozen and free of stones larger than 150 mm in diameter, slag, ash, sod, topsoil, waste or other deleterious materials. The plasticity index of the material must be less than fifteen (15).
- .3 Geotextiles: to Section 31 32 19.01 - Geotextiles.

### 3. Execution

#### .1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

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

#### .2 SITE PREPARATION

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

#### .3 PREPARATION/PROTECTION

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .4 Protect buried services that are required to remain undisturbed.

#### .4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
  - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as indicated by Departmental Representative.
  - .1 Stockpile height not to exceed 3 m and should be protected from erosion.
- .4 Dispose of unused topsoil off site.

**.5 STOCKPILING**

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

**.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.

**.7 EXCAVATION**

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Remove concrete, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.



- .6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by current standards (CSST).
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site with respect to the environmental standards enforce.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Departmental Representative when bottom of excavation is reached.
- .12 Obtain Departmental Representative approval of completed excavation.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .14 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .15 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

**.8 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D1557- Corrected Maximum Dry Density.
  - .1 Exterior side of perimeter walls: use class B, fill to subgrade level. Compact to 95% of corrected maximum dry density.
  - .2 Under concrete slabs: provide 150 mm compacted thickness base course of Type MG-20 fill to underside of slab. Compact base course to 100%.

**.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 11 16 - Site Water Utility Distribution Piping, Section 33 31 13 - Public Sanitary Utility Sewerage Piping, Section 33 41 00 - Strom Utility Drainage Piping et Section 33 42 13 – Pipe Culverts.

- .2 Place bedding and surround material in unfrozen condition.

#### .10 **BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast on site concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 1 m.

#### .11 **RESTORATION**

- .1 Replace topsoil as indicated or as directed by Departmental Representative.
- .2 Reinstall lawns to elevation which existed before excavation.
- .3 Reinstall pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 14 13 – Soil stripping and stockpiling
- .2 Section 31 23 33.01 – Excavating, trenching and backfilling (short form)
- .3 Section 32 11 23 – Aggregate base course
- .4 Section 32 11 16.01 – Granular sub-base

### .2 MEASUREMENT PROCEDURES

- .1 Stripping: measure in cubic metres calculated from cross sections taken by Departmental Representative in areas of excavation.
  - .1 Departmental Representative will take initial cross sections after clearing and grubbing completed.
  - .2 Stripping unit price to include cost of placing material on slopes upon completion of excavation and embankment.
- .2 Common Excavation: measure in cubic metres calculated from cross sections taken by Departmental Representative in areas of excavation.

### .3 REFERENCES

- .1 Definitions:
  - .1 Rock Excavation: excavation of:
    - .1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort with a Caterpillar D9 crawler bulldozer or equivalent to be considered integral with parent mass.
    - .2 Boulder or rock fragments measuring in volume 1 cubic metre or more.
  - .2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping.
  - .3 Unclassified Excavation: excavation of whatever character other than stripping encountered in the Work.
  - .4 Free Haul: distance that excavated material is hauled without compensation. Free haul distance to be 0.5 km or less.
  - .5 Stripping: excavation of organic material covering original ground.

- .6 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved.
- .7 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
- .8 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.
- .9 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.
- .10 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Reference Standards:
  - .1 ASTM International
    - .1 ASTM D698-[07ea1], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .2 American Association of State Highway and Transportation Officials (AASHTO)
    - .1 AASHTO T99-[10], Standard Method of test for Moisture-Density Relations of Soils Using a 2.5 kg (5.5lb) Rammer and 305 mm (12 in) Drop.
- .4 **ACTION AND INFORMATIONAL SUBMITTALS**
  - .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit for approval and review blasting program including preshear details, powder factors fly-rock control, and vibration monitoring methods.
- .5 **QUALITY ASSURANCE**
  - .1 Regulatory Requirements:
    - .1 Adhere to regulations of authority having jurisdiction when blasting is required.
    - .2 Adhere to Provincial and National Environmental requirements when [potentially] toxic materials are involved.

## **2. Products**

### **.1 MATERIALS**

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

## **3. Execution**

### **.1 COMPACTION EQUIPMENT**

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

### **.2 WATER DISTRIBUTORS**

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

### **.3 STRIPPING [OF TOPSOIL]**

- .1 Place top soil and finish grading in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .2 Commence topsoil stripping of areas as indicated Departmental Representative.
- .3 Strip topsoil to depths as indicated Departmental Representative. Do not mix topsoil with subsoil.
- .4 Stockpile in locations as indicated by Departmental Representative.
  - .1 Stockpile height: not to exceed 2 m.
- .5 Dispose of unused topsoil off site.

- .6 Remove clearing and grubbing debris from stripping.
- .7 Spread organic stripping, on completion of excavation and embankment construction, on slopes and trim or remove from site if quantity exceeds ability to grade on site.

#### .4 EXCAVATING

- .1 General:
  - .1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.
  - .2 Sub-excavate 510 mm below subgrade in cut sections unless otherwise directed by Departmental Representative.
    - .1 Compact top 150 mm below sub-excavate to minimum 95% maximum dry density, to ASTM D698.
    - .2 Replace with approved embankment material and compact to specified embankment density.
- .2 Drainage:
  - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
  - .2 Provide ditches as work progresses to provide drainage.
  - .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

#### .5 EMBANKMENTS

- .1 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.
- .2 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .3 Drain low areas before placing materials.
- .4 Deductions from excavation will be made for overbuild of embankments.

#### .6 COMPACTION

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results
  - .1 For tamping rollers, use equipment that exerts 1000 kPa minimum of pressure on tamping surface of each tamping foot in transverse row.

- .3 Compact each layer to minimum 95% maximum dry density:ASTM D698 (AASHTO T99) except top 150 mm of subgrade.

- .1 Compact top 150 mm to 100% maximum dry density.

- .4 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

**.7 FINISHING**

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

**.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 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**.9 PROTECTION**

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

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 32 12 16.01 – Asphalt paving (short form)

### .2 MEASUREMENT AND PAYMENT

- .1 Measure geotextiles in square metres of surface covered by material.  
No allowance will be made for seams and overlaps.

### .3 REFERENCES

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



.1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS 1860-November 2010, Material Specification for Geotextiles.

**.4 ACTION AND INFORMATIONAL SUBMITTALS**

.1 Submit in accordance with Section 01 33 00 - Submittal Procedure].

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit following samples 4 weeks prior to beginning Work.

.1 Minimum length of 2 m of roll width of geotextile.

.2 Methods of joining.

.4 Test and Evaluation Reports:

.1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

**.5 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect geotextiles from direct sunlight and UV rays.

.3 Replace defective or damaged materials with new.

**2. Products**

**.1 MATERIAL**

.1 Geotextile: [woven] [non-woven] synthetic fibre fabric, supplied in rolls.

.1 Width: 3.5 m minimum.

.2 Length: 150 m minimum.

- .3 Composed of: minimum 85% by mass of polypropylene with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
- .2 Physical properties:
  - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 1.1 mm.
  - .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 200 g/m<sup>2</sup>.
  - .3 Grab tensile strength and elongation: to [CAN/CGSB-148.1, No.7.3].
  - .4 Breaking force: minimum 550 N, wet condition.
  - .5 Elongation at future: minimum 45%.
  - .6 Ball burst strength: to CAN/CGSB-4.2, No.11.2, minimum 250 N, wet condition.
  - .7 Bursting strength: to CAN/CGSB-148.1, No.6.1 minimum 1585 kPa, wet condition.
- .3 Hydraulic properties:
  - .1 Apparent opening size (AOS): to ASTM D4751, 150 micrometres.
  - .2 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10 OPSS 1860.
  - .3 Transmissivity: to ASTM D4716, minimum 0.23 cm/s under test conditions of number 4.
  - .4 Permittivity: to [ASTM D4491], 1.34 s<sup>-1</sup>.

### 3. Execution

#### .1 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 After installation, cover with overlying layer within 4 hours of placement.

- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

- .2 **CLEANING**

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

- .3 **PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

## **1 General**

### **.1 RELATED SECTIONS**

- .1 Section 31 32 19.01 - Geotextiles.
- .2 Section 31 05 16 – Aggregate materials

### **.2 REFERENCES**

- .1 Quebec Government
  - .1 CCDG-2013-12, Cahier des Charges et Devis Généraux, Fondation de chaussée, perrés.
  - .2 BNQ 2560-114/2007, Bureau de Normalisation du Québec. Granulats.

MTQ tome VII ch 14 Matériaux, Normes, Quebec Ministry of Transport.

## **2. Products**

### **.1 STONE**

- .1 Hard, with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:
  - .1 Random rip-rap MTQ type 1:
    - .1 The stones used are of 200-0 mm gauge.
    - .2 Not less than 50% of total volume of stones with 100 mm size.

## **3. Execution**

### **.1 PLACING**

- .1 Place rip-rap to thickness and details as indicated.
- .2 Place stones in manner approved by DCC Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 05 16 – Aggregate materials
- .2 Section 31 24 13 – Roadway embankments
- .3 Section 31 32 19.01 - Géotextiles
- .4 Section 32 11 23 – Aggregate base course

### .2 MEASUREMENT AND PAYMENT

- .1 Measure granular sub-base in cubic metres measured in place of material incorporated into Work and accepted by Departmental Representative.

### .3 REFERENCES

- .1 ASTM International
  - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
  - .5 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .6 ASTM D1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .7 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .8 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 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).

- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
- .4 U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .4 **ACTION AND INFORMATIONAL SUBMITTALS**
  - .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .5 **DELIVERY, STORAGE AND HANDLING**
  - .1 Storage and Handling Requirements:
    - .1 Store materials in accordance with manufacturer's recommendations.
    - .2 Replace defective or damaged materials with new.

## **2. Products**

- .1 **MATERIALS**
  - .1 Granular sub-base material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
    - .1 Crushed, pit run or screened stone Type MG-20 and MG-56 conformed of 3103 certification of MTQ..
    - .2 Other properties as follows:
      - .1 Liquid Limit: to ASTM D4318, Maximum 25.
      - .2 Plasticity Index: to ASTM D4318, Maximum 6.
      - .3 Los Angeles degradation: to ASTM C131.
        - .1 Maximum loss by mass: 40 %.
      - .4 Particles smaller than 0.02 mm: to ASTM D422, Maximum 3%.
      - .5 Soaked CBR: to ASTM D1883, Minimum 40 when compacted to 100% of ASTM D1557.

### 3. Execution

#### .1 PREPARATION

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

#### .2 PLACING

- .1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
  - .1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 Remove and replace portion of layer in which material has become segregated during spreading.

**.3 COMPACTION**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative.
- .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compact to density of not less than 95% corrected maximum dry density in accordance with ASTM D698 ASTM D1557.
- .5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .6 Apply water as necessary during compaction to obtain specified density.
- .7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

**.4 PROOF ROLLING**

- .1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.
- .2 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.
- .3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .4 Where proof rolling reveals areas of defective subgrade:
  - .1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.
  - .2 Backfill excavated subgrade with sub-base material and compact in accordance with this section and compact.
  - .3 Replace sub-base material and compact.
- .5 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.



**.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.

**.6 SITE TOLERANCES**

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

**.7 PROTECTION**

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

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 24 13 – Roadway embankments
- .2 Section 31 05 16 – Aggregate materials
- .3 Section 32 11 16.01 – Granular sub-base

### .2 MEASUREMENT AND PAYMENT

- .1 Measure granular base in cubic metres of material incorporated into Work and accepted in writing by Departmental Representative.

### .3 REFERENCES

- .1 ASTM International
  - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .5 ASTM D1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**.4 ACTION AND INFORMATIONAL SUBMITTALS**

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

**.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 31 05 16 - Aggregate Materials.
- .2 Storage and Handling Requirements:
- .1 Stockpile minimum 50% of total aggregate required prior to beginning operation.

**2. Products**

**.1 MATERIALS**

- .1 Granular base: material in accordance with Section [31 05 16 - Aggregate Materials] and following requirements:
- .1 Crushed stone or gravel MG-20 and MG-56 accordance with section 3103 of MTQ.

**3. Execution**

**.1 PREPARATION**

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

**.2 PLACEMENT AND INSTALLATION**

- .1 Place granular base after sub-base surface is inspected and approved in writing by Departmental Representative.
- .2 Placing:
- .1 Construct granular base to depth and grade in areas indicated.

- .2 Ensure no frozen material is placed.
- .3 Place material only on clean unfrozen surface, free from snow and ice.
- .4 Begin spreading base material on crown line or on high side of one-way slope.
- .5 Place material using methods which do not lead to segregation or degradation of aggregate.
- .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .9 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment:
  - .1 Ensure compaction equipment is capable of obtaining required material densities.
  - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative.
  - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting:
  - .1 Compact to density not less than 95% corrected maximum dry density ASTM D698.
  - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .3 Apply water as necessary during compacting to obtain specified density.
  - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.
  - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
  - .6 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
  - .7 Where proof rolling reveals areas of defective subgrade:
    - .1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with common material.

**.3 SITE TOLERANCES**

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

**.4 CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**.5 PROTECTION**

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

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 31 05 16 – Aggregate materials
- .2 Section 31 24 13 – Roadway embankments
- .3 Section 31 32 19.01 - Géotextiles
- .4 Section 32 11 16.01 – Granular sub-base
- .5 Section 32 11 23 – Aggregate base course
- .6 Section 32 17 23 – Pavement markings

### .2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D1557-07, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
- .2 Government of Québec, Transport Québec
  - .1 Cahier des charges et devis généraux (CCDG) - Infrastructure routières - Construction et réparation, édition 2013.
  - .2 BNQ 2560-114/2007, Bureau de Normalisation du Québec, Enrobés à chaud.

### .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 asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.

## 2. Products

### .1 MATERIALS

- .1 Geotextile to: CCDG
- .2 Aggregates: to CCDG.
  - .1 Crushed Granular MG 20, MG 56.
  - .2 Recycled granular MG-112

- .3 Natural Gravel 80-0.

### 3. Execution

#### .1 FOUNDATIONS

- .1 Foundations for parkings lots comprise:
  - .1 Geotextile.
  - .2 300 mm compacted thickness of granular subbase MG-56
  - .3 150 mm compacted thickness of granular base MG-20
- .2 Compaction: compact each lift of granular material to 95% maximum density to ASTM D1557

#### .2 PAVEMENT THICKNESS

- .1 Pavements for parking lots:
  - .1 Wear course: 60 mm, bitumen PG-58-28

#### .3 PAVEMENT CONSTRUCTION

- .1 Surface preparation: CCDG.
- .2 Application of prime coat and tack coat: CCDG.
- .3 Construction of asphalt concrete: CCDG.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 03 30 00.02 – Cast in place concrete (short form)
- .2 Section 31 05 16 – Aggregate materials
- .3 Section 31 24 13 – Roadway embankments
- .4 Section 32 11 16.01 – Granular sub-base
- .5 Section 32 11 23 – Aggregate base course

### .2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-04, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
  - .4 ASTM D698-00a<sup>1</sup>, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-3.3-[99(March 2004)], Kerosene, Amend. No. 1, National Standard of Canada.
  - .2 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-[04]/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 Gouvernement du Québec
  - .1 CCDG-2013-15, Cahier des charges et devis généraux, Ouvrage en béton.
  - .2 BNQ 1809-500/2006, Bureau de Normalisation du Québec, Trottoirs et bordures en béton.  
MTQ Normes 3101 Tome VII, Matériaux ch 3, Bétons et produits connexes, Ministère du Transport du Québec.



**.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.

**2. Products**

**.1 MATERIALS**

- .1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Granular base: material to Section 31 05 16 - Aggregate Materials following requirements:
  - .1 Type MG-20 fill.
  - .2 Crushed stone or gravel.
  - .3 Gradations: within limits specified when tested to ASTM C136 ASTM C117. Sieve sizes to CAN/CGSB-8.1.
- .4 Boiled linseed oil: to [ASTM D260].

**3. Execution**

**.1 GRADE PREPARATION**

- .1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Construct embankments using excavated material free from organic matter or other objectionable materials.
  - .1 Dispose of surplus and unsuitable excavated material off site.
- .3 When constructing embankment provide for minimum 1.5 m shoulders, where applicable, outside of neat lines of concrete.
- .4 Place fill in maximum 150 mm layers and compact to at least 95 % of maximum dry density to ASTM D698.

**.2 GRANULAR BASE**

- .1 Obtain Departmental Representative's approval of subgrade before placing granular base.

- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Compact granular base in maximum 150 mm layers to at least 95% of maximum density to ASTM D698.

**.3 CONCRETE**

- .1 Departmental Representative approval of granular base prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .4 Provide edging as indicated with 10 mm radius edging tool.
- .5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

**.4 TOLERANCES**

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

**.5 EXPANSION AND CONTRACTION JOINTS**

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 4.5 m.
- .2 Install expansion joints as indicated by Departmental Representative at intervals of 24 m.
- .3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

**.6 CURING**

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

**.7 BACKFILL**

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material as directed by Departmental Representative.
  - .1 Compact and shape to required contours as indicated by Departmental Representative.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 32 12 16.01 – Asphalt paving (short form)

### .2 MEASUREMENT FOR PAYMENT

- .1 Pavement marking: measured by global price.

### .3 REFERENCES

- .1 Environment Canada (EC)
  - .1 Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations, SOR/2009-264.
- .2 Green Seal (GS)
  - .1 GS-11-[2013], Standard for Paints and Coatings.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.
    - .1 MPI #32 Traffic Markings Paint, Alkyd.
- .5 South Coast Air Quality Management District (SCAQMD)
  - .1 SCAQMD Rule 1113-13, Architectural Coatings.
- .6 Gouvernement du Québec
  - .1 CCDG-2013-17, Cahier des charges et devis généraux, Marquage de chaussée.
  - .2 MTQ Tome V ch 6, Normes du Ministère du Transport du Québec, Marques sur la chaussée.

### .4 ACTION AND INFORMATIONAL SUBMITTALS

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

- .1 Submit to [Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
  - .1 Two 1 L samples of each type of paint.
  - .2 One 1 kg sample of glass beads.
  - .3 Sampling to MPI Painting Manual.
- .2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.

**.5 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

**.6 SITE CONDITIONS**

- .1 Sustainable Design Provisions:
  - .1 Seasonal restriction for high VOC content traffic marking coatings.
    - .1 Traffic marking coating application between May 1st and October 15th is subject to seasonal use restriction and must not have a VOC concentration in excess of 150 g/L.

**2. Products**

**.1 MATERIALS**

- .1 Paint and Markings:
  - .1 To MPI #32, Alkyd zone/traffic marking.
  - .2 Traffic Marking Coatings: maximum VOC limit 100 g/L to SOR/2009-264 Schedule 1 to SCAQMD Rule 1113
  - .3 Paints: in accordance with MPI recommendation for surface conditions.
  - .4 Colour: to MPI listed, white, black, yellow.
- .2 Thinner: to MPI listed manufacturer.
- .3 Glass reflective beads: type suitable for application to wet paint surface for light reflectance.

### 3. Execution

#### .1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.
  - .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .3 Proceed with Work only after unacceptable conditions have been rectified.

#### .2 EQUIPMENT REQUIREMENTS

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

#### .3 APPLICATION

- .1 Pavement markings: laid out by Departmental Representative.
- .2 Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 10 degrees C, wind speed is less than 60 km/h and no rain is forecast within next 4 hours.
- .3 Apply traffic paint evenly at rate of 3 m<sup>2</sup>/L.
- .4 Do not thin paint unless approved by Departmental Representative.
- .5 Symbols and letters to dimensions indicated.
- .6 Paint lines of uniform colour and density with sharp edges.
- .7 Thoroughly clean distributor tank before refilling with paint of different colour.
- .8 Apply glass beads at rate of 0.5 kg/L of painted area immediately after application of paint.

#### .4 TOLERANCE

- .1 Paint markings: within plus or minus 12 mm of dimensions indicated.

**.5 PROTECTION**

- .1 Protect pavement markings until dry.
- .2 Repair damage to adjacent materials caused by pavement marking application.

**END OF SECTION**

## **1. General**

### **.1 MEASUREMENT AND PAYMENT**

- .1 Payment for sodding will be made at unit price bid of actual area surface measurements taken and computed by Departmental Representati] for:
  - .1 Turf Grass Nursery Sod Type Number One Kentucky Bluegrass Sod - Fescue Sod per square metre.

### **.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Scheduling:
  - .1 Schedule sod laying to coincide with preparation of soil surface.
  - .2 Schedule sod installation when frost is not present in ground.
  - .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

### **.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for sod, geotextile and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.
- .3 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

### **.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Landscape Contractor: to be a Member in Good Standing of Quebec 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.



**.5 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials in accordance with supplier's recommendations.
  - .2 Replace defective or damaged materials with new.

**2. Products**

**.1 MATERIALS**

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

**.2 SOURCE QUALITY CONTROL**

- .1 Obtain written approval from Departmental Representative of sod at source.

- .2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

### 3. Execution

#### .1 INSTALLERS

- .1 Use installers who are Member in Good Standing of Quebec Horticultural Trades Association.

#### .2 EXAMINATION

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

#### .3 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod plus or minus 15 mm for Commercial Grade Turf Grass Nursery, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials[off site.

#### .4 SOD PLACEMENT

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.

- .2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

**.5 SOD PLACEMENT ON SLOPES AND PEGGING**

- .1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.
- .2 Start laying sod at bottom of slopes.
- .3 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:
  - .1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.
  - .2 Not less than 3-6 pegs per square metre.
  - .3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Departmental Representative.
  - .4 Drive pegs to 20 mm above soil surface of sod sections.

**.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 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.

**.7 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of installation until acceptance.
  - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

- .2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.
- .3 Maintain sodded areas weed free 95%.
- .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
- .5 Temporary barriers or signage to be maintained where required to protect newly established sod.

## **.8 ACCEPTANCE**

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

## **.9 MAINTENANCE DURING WARRANTY PERIOD**

- .1 Perform following operations from time of acceptance until end of warranty period:
  - .1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
- .2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.
- .3 Cut grass and remove clippings that will smother grass.
  - .1 Turf Grass Nursery Sod:
    - .1 50 mm during normal growing conditions.
  - .2 Commercial Grade Turf Grass Nursery Sod :
    - .1 60 mm during normal growing conditions.

- .3 Cut grass at 2 week intervals or as directed by Departmental Representative, but at intervals so that approximately one third of growth is removed in single cut.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 03 30 00.02 – Cast in place concrete (short form)
- .2 Section 31 23 33.01 – Excavating, trenching and backfilling
- .3 Section 31 05 16 – Aggregate materials

### .2 REFERENCES

- .1 ASTM International
  - .1 ASTM C12-09, Standard Practice for Installing Vitrified Clay Pipe Lines.
  - .2 ASTM C14M07, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
  - .3 ASTM C76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
  - .4 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .5 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .6 ASTM C425-04(2009), Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
  - .7 ASTM C428-97(06), Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
  - .8 ASTM C443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
  - .9 ASTM C506M-10b, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.
  - .10 ASTM C507M[10b, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe (Metric).
  - .11 ASTM C663-98(2008), Standard Specification for Asbestos-Cement Storm Drain Pipe.
  - .12 ASTM C700-11, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
  - .13 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .14 ASTM D1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.

- .15 ASTM D1869-95(2010), Standard Specification for Rubber Rings for Asbestos-Cement Pipe.
- .16 ASTM D2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .17 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .18 ASTM F405-05 Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
- .19 ASTM F667-06, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
- .20 ASTM F794-03(2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- .2 Bureau de normalisation du Québec (BNQ)
  - .1 BNQ-3624-115-[2004], Polyethylene (PE) Pipe and Fittings - Flexible Corrugated Pipes and Drainage - Characteristics and Test Methods
- .3 CSA International
  - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium.
  - .2 CSA A257 Series-M92(R2009), Standards for Concrete Pipe.
  - .3 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.
  - .4 CSA G401-07, Corrugated Steel Pipe Products.
- .4 U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .5 Gouvernement du Québec
  - .1 CCDG-2013-12, Cahier des charges et devis généraux, Éléments de drainage
  - .2 BNQ 1809-300/2009, Bureau de Normalisation du Québec, Conduites d'eau potable et d'égout
  - .3 BNQ 2560-114/2007, Bureau de Normalisation du Québec, Granulats.
  - .4 BNQ 3624-130/2001, Bureau de Normalisation du Québec, Tuyaux et raccords PVC

### .3 SCHEDULING

- .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

**.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes, and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certification to be marked on pipe.
- .4 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.
- .5 Manufacturer's Instructions: submit to Departmental Representative 2 copy of manufacturer's installation instructions.

**.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect pipes from damage.
  - .3 Replace defective or damaged materials with new.

**2. Products**

**.1 CONCRETE PIPE**

- .1 Reinforced circular concrete pipe and fittings: to CSA A257, ASTM C76M 450 mm diameter, strength classification type IV, designed for flexible rubber gasket joints to ASTM C443M CSA A257.
  - .1 Accepted product: Brunet, Aubert & Marois, St-Germain
- .2 Reinforced concrete arch pipe: to ASTM C506M.
- .3 Lifting holes:
  - .1 Pipe 900 mm and less diameter: no lift holes.



**.2 PLASTIC PIPE**

- .1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D3034 CAN/CSA-B1800.
  - .1 Standard Dimensional Ratio (SDR): 35.
  - .2 Separate gasket and integral bell system.
  - .3 Nominal lengths:6 m.  
Accepted product: IPEX, Royal, Ever-Green.

**.3 PIPE BEDDING AND SURROUND MATERIAL**

- .1 Granular material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Crushed stone MG-20, CG-14
  - .2 Gradations to be within limits specified when tested to [ASTM C136] [ASTM C117]. Sieve sizes to [CAN/CGSB-8.1] [CAN/CGSB-8.2].
- .2 Table:

Sieve Designation (mm)	% Passing	
Stone/Gravel	Gravel/Sand	
	MG 20	CG-14
112	-	-
80	-	-
56	-	-
40	-	-
31.5	100	-
20	90-100	100
14	68-93	-
5.00	35-60	35-100
1.25	19-38	-
0.315	9-17	-
0.160	-	-
0.080	2-7	0-10

- .3 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

**3. Execution**

**.1 TRENCHING**

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Protect trench from contents of sewer.

- .3 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by Departmental Representative.

**.2 GRANULAR BEDDING**

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layer not exceeding 150 mm compacted thickness.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
  - .1 Do not use blocks when bedding pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95 % corrected maximum dry density.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

**.3 INSTALLATION**

- .1 Lay and join pipes to: ASTM C12.
- .2 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .3 Handle pipe using methods approved by Departmental Representative.
  - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .6 Lay corrugated steel pipe:
  - .1 With outside circumferential laps facing upgrade and longitudinal laps or seams at side or quarter points.
  - .2 With longitudinal centre line of paved invert coinciding with flow line.
- .7 Joint deflection permitted within limits recommended by pipe manufacturer.

- .8 Water to flow through pipes during construction only as permitted by Departmental Representative.
- .9 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .10 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.
- .11 Joints:
  - .1 Corrugated steel pipe:
    - .1 Install gaskets as indicated.
    - .2 Match corrugations or indentations of coupler band with pipe sections before tightening.
    - .3 Tap coupler firmly while tightening, to take up slack and ensure snug fit.
    - .4 Ensure bolts are inserted and tightened.
  - .2 Concrete, clay and asbestos cement pipe:
    - .1 Install gaskets as recommended by manufacturer.
    - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
    - .3 Align pipes before joining.
    - .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
    - .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
    - .6 Complete each joint before laying next length of pipe.
    - .7 Minimize joint deflection after joint has been made to avoid joint damage.
    - .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
    - .9 Mortared joints:
      - .1 Pipe interior: circular pipes 700 mm diameter and larger, and arch or elliptical pipe equivalent to [900] mm diameter or larger shall have interior gap between ends of adjacent pipes filled with mortar.
        - .1 Apply mortar minimum 7 days after backfilling has been completed to allow pipe settlement to occur.

- .2 Finish interior surface of joints smooth.
    - .2 Pipe exterior: for bell and spigot pipe, use mortar to seal outside of joints. Press and bed mortar into place.
      - .1 Allow mortar to set minimum of 1 hour before backfilling.
  - .12 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative to prevent "creep" during down time.
  - .13 Plug lifting holes with Departmental Representative approved prefabricated plugs set in shrinkage compensating grout.
  - .14 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
  - .15 Make watertight connections to manholes and catch basins.
    - .1 Use shrinkage compensating grout when suitable gaskets are not available.
  - .16 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
    - .1 Joint to be structurally sound and watertight.
  - .17 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.
- .4 **PIPE SURROUND**
- .1 Place surround material in unfrozen condition.
  - .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
    - .1 Leave joints and fittings exposed until field testing is completed.
  - .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
  - .4 Place layers uniformly and simultaneously on each side of pipe.
  - .5 Compact each layer from pipe invert to mid height of pipe to at least 95 % corrected maximum dry density to ASTM D698].
- .5 **BACKFILL**
- .1 Place back fill material in unfrozen condition.
  - .2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

- .3 Under paving and walks, compact backfill to at least 95 % corrected maximum dry density to ASTM D698. In other areas, compact backfill to at least 90 % corrected maximum dry density to ASTM D698.
- .4 Place unshrinkable backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**.6 FIELD TESTS AND INSPECTIONS**

- .1 Remove foreign material from sewers and related appurtenances by flushing with water.
- .2 Television and photographic inspections:
  - .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.
  - .2 Provide means of access to permit Departmental Representative to do inspections.

**.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.

**END OF SECTION**

## 1. General

### .1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Electrical - Common Work Results for Electrical
- .2 Section 26 05 43.01 - Electrical - Installation of Cables in Trenches and in Ducts.

### .2 REFERENCES

- .1 CSA International
  - .1 CSA C22.2 No. 211.0.

### .3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

### .4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

## 2. Products

### .1 PVC DUCTS AND FITTINGS

- .1 Rigid PVC duct: Type ES2-rigid, with moulded fittings, for direct burial expanded flange ends, Trade size 6.
  - .1 Nominal length: 3 m plus or minus 12 mm.
- .2 Rigid PVC split ducts.

- .3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.
- .4 Rigid PVC 90 degrees, 45 degrees bends as required.
- .2 SOLVENT WELD COMPOUND
  - .1 Solvent cement for PVC duct joints.
- .3 CABLE PULLING EQUIPMENT
  - .1 6 mm stranded nylon pull rope tensile strength 5 kN.
- .4 WARNING TAPE
  - .1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".

### **3. Execution**

- .1 MANUFACTURER'S INSTRUCTIONS
  - .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 INSTALLATION
  - .1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.
  - .2 Clean inside of ducts before laying.
  - .3 Slope ducts with 1 to 400 minimum slope.
  - .4 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.
  - .5 Pull through each duct steel mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.

- .1 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .6 Install a pull rope continuous throughout each duct run with 2 m spare rope at each end.
- .7 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.
- .8 Install markers as required.
- .9 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.
- .3 **CLEANING**
  - .1 Clean in accordance with Section 01 74 11 - Cleaning.
    - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**