



PUBLIC WORKS AND GOVERNMENT SERVICES CANADA  
CSC-FEDERAL TRAINING CENTER  
UPGRADE OF ELECTRICAL DISTRIBUTION IN TUNNELS

■ ■ ■

SPECIFICATIONS

Building services

■ ■ ■

PWGSC/Ref. : R.061196.001

CSC/Ref. : 550-2-320-4126

BPR/Ref. : 18307A

■ ■ ■

Issued for tender

April 25<sup>th</sup>, 2014



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CSC-FEDERAL TRAINING CENTER  
UPGRADE OF ELECTRICAL DISTRIBUTION IN TUNNELS



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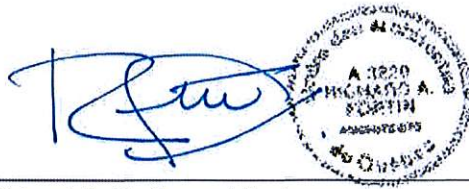
  
  
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April 25<sup>th</sup>, 2014/ Issued for tender



ARCHITECTS :            BISSON FORTIN AND ASSOCIATES ARCHITECTS

A handwritten signature in blue ink, appearing to read 'R. Fortin', is written over a circular professional seal. The seal contains the text 'A 1020', 'RICHARD A. FORTIN', and 'ARCHITECT'.

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Richard A. Fortin, architect

**END OF SECTION**



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|        |                    |
|--------|--------------------|
| Annexe | Rapport Inspec-Sol |
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| <b>NUMBER</b>     | <b>TITLE</b>   |
|-------------------|--|
| R_061196_001_A01: | Architecture - Site plan   |
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| R_061196_001_E06: | Electrical - Building C-15, B12 and 11– Basement - Services demolition                     |
| R_061196_001_E07: | Electrical - Building 10, 7, 8, 5 and 6 –Basement – Services demolition                    |
| R_061196_001_E08: | Electrical - Building 2 and 1 – Basement - Services demolition                             |
| R_061196_001_E09: | Electrical - Building C-15, B12 and 11 – Basement – Services new layout                    |
| R_061196_001_E10: | Electrical - Building 10, 7, 8, 5 and 6 – Basement – Services new layout                   |
| R_061196_001_E11: | Electrical - Building 2 and 1 – Basement – Services new layout                             |
| R_061196_001_E12: | Electrical – Distribution demolition   |
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| R_061196_001_C03: | Civil – Work - details   |



## **1 GENERAL**

### **1.1 WORK BY OTHERS**

- .1 Cooperate with other Contractors in carrying out their respective works and carry out instructions from the Departmental Representative.
- .2 Coordinate 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 the Departmental Representative, in writing, any defects which may interfere with proper execution of Work.
- .3 In a second future work phase, in building C15, tunnels and establishment, other contractors will intervene in same areas of C15 as the contractors for the replacement of main emergency power generator (phase 1). Those contractors will install their site trailers in building C15 sector. Foresce two (2) coordination site meetings for the new generator (phase 1) and phase 2 work, new main distribution panel.

### **1.2 FUTURE WORK**

- .1 Insure that Work avoids encroachment into areas required for future work.

### **1.3 WORK SEQUENCE**

- .1 Construct Work in stages to accommodate the Departmental Representative's use of premises during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with the Departmental Representative Occupancy during construction.
- .3 Required stages:
  - .1 Preparation and execution of the Civil Works excavation, backfill, openings, etc.
  - .2 Preparation and execution of temporary measures in order to maintain full power service continuity.
  - .3 Supply and installation of underground cables.
  - .4 Supply and installation of new electrical distribution equipment.
  - .5 Dismantling of equipment, conduits, cables and busducts as indicated.
  - .6 Repowering of existing buildings and services, as indicated.
  - .7 Construction of new electrical rooms in building 1 and new exterior.
  - .8 Construction of new exterior satelite electrical room.
  - .9 Architectural, structural, mechanical, electrical and civil work.
  - .10 Installation of site trailers and hoarding of work area to the satisfaction of the Departmental Representative.
  - .11 Testing and commissioning of all new systems.

- .4 Construct Work in stages to provide for continuous Departmental usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .5 Maintain fire access/control.
- .6 Submit shop drawing for long delivery equipment (generator, walk-in enclosure, reservoir) at the beginning of work.

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

- .1 Unrestricted use of site until Substantial Performance.
- .2 Limit use of premises for Work, for storage, and for access, to allow:
  - .1 The Departmental Representative occupancy.
- .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.

#### **1.5 OCCUPANCY BY THE DEPARTMENTAL REPRESENTATIVE**

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

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

- .1 Execute work with least possible interference or disturbance to building operations and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

#### **1.7 EXISTING UTILITY SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities.
- .3 Provide alternative routes for personnel and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services when directed by Departmental Representative to maintain critical building and establishment electrical loads.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.
- .11 Schedule and submit a written request to Hydro-Québec for a planned power shut-down and electrical service reenergizing for the transfer of the existing HQ chambre-annexe power supply from the existing main distribution panelboard to the new main distribution panelboard.
- .12 Submit to HQ and to the Departmental Representative a new electrical protection coordination study for the new 4000A main distribution panelboard with the existing 2000 kVA HQ chambre-annexe.
- .13 Submit to HQ and to the Departmental Representative the new main distribution panelboard shop drawings and request HQ to supply new metering transformers for the new main distribution panelboard. Request that HQ
- .14 Provide a lump sum allowance of 10,000.\$ excluding taxes for HQ expenditures, obtain a from HQ a detailed estimation of costs and submit to the Departmental Representative receipts of payment.

## 1.8 REQUIRED DOCUMENTS

- .1 Maintain at job site, one copy each document as follows:

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.

**2 PRODUCTS**

**2.1 NOT USED**

**3 EXECUTION**

**3.1 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 35 13 – Special Project Procedures for Correctional Service Canada Security Requirements.

### **1.02 ACCESS AND EGRESS**

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

### **1.03 USE OF SITE AND FACILITIES**

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

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

- .1 Execute work with least possible interference or disturbance to building operations, occupants and public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

### **1.05 EXISTING SERVICES**

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

### **1.06 SPECIAL REQUIREMENTS**

- .1 Carry out noise generating Work Monday to Friday during the dayly hours defined by the Departmental Representative.
- .3 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule -

Bar (GANTT) Chart.

- .4 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .5 Keep within limits of work and avenues of ingress and egress.
- .6 Ingress and egress of Contractor vehicles at site is limited as defined by the Departmental Representative .
- .7 Deliver materials during hours defined by the Departmental Representative.

#### **1.07 SECURITY**

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
  - .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
  - .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.
  - .3 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
  - .4 Contractor's personnel will require satisfactory RCMP initiated security screening in order to complete Work in premises and on site.
- .3 Security escort:
  - .1 Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
  - .2 Submit an escort request to Departmental Representative at least 14 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative. Cost incurred by late request will be Contractor's responsibility.
  - .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
  - .4 Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 4 hours for late cancellations.

#### **1.08 BUILDING SMOKING ENVIRONMENT**

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

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 32 16.07 – Construction Progress Schedules – Bar (GANTT) Chart.

### **1.02 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance Departmental Representative.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

### **1.03 PRECONSTRUCTION MEETING**

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
  - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities,

- fences in accordance with Section 01 52 00 - Construction Facilities.
- .5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .7 Owner provided products.
- .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

#### **1.04 PROGRESS MEETINGS**

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings monthly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum seven days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three days after meeting.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**





## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 11 01 - Work Related General Information.

### **1.02 DEFINITIONS**

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

### **1.03 REQUIREMENTS**

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

#### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 14 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

#### **1.05 PROJECT MILESTONES**

- .1 Proposed project milestones form interim targets for Project Schedule.
  - .1 Excavation completed within 60 working days of Award of Contract date.
  - .2 New underground cables installed within 75 working days of award of contract date.
  - .3 New electrical distribution installation completed within 100 working days of award of contract date.
  - .4 Dismantling of existing electrical distribution, electrical and mechanical works, completed within 150 working days of award of contract date.
  - .5 Provisional completion certificate of works to be delivered at the latest 180 working days of award of contract date.
- .2 Define the exact project construction milestones for bar chart.
- .3 Consider work phases as defined on drawings in order to establish real project milestones.

#### **1.06 MASTER PLAN**

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

#### **1.07 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.

- .4 Mobilization.
- .5 Excavation.
- .6 Backfill.
- .7 Slab on grade.
- .8 Structural Steel.
- .9 Siding and Roofing.
- .10 Interior Architecture (Walls, Floors and Ceiling).
- .11 Plumbing.
- .12 Lighting.
- .13 Electrical.
- .14 Piping.
- .15 Controls.
- .16 Fire Systems.
- .17 Testing and Commissioning.
- .18 Supplied equipment long delivery items.

#### **1.08 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

#### **1.09 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings (by two weeks), identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

### **2 PRODUCTS**

#### **2.01 NOT USED**

### **3 EXECUTION**

#### **3.01 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

- .1 Not Used.

### **1.03 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.

### **1.04 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 Province of Quebec 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 10 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 six (6) copies and one electronic copy 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 six (6) copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit six (6) copies and one electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit six (6) copies and one electronic copy 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 six (6) copies and one electronic copy 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 six (6) copies and one electronic copy 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, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

- .21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

#### **1.05 SAMPLES**

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

#### **1.06 MOCK-UPS**

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

#### **1.07 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic and hard copy of colour digital photography in jpg format, monthly with progress statement and as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 2 locations.
  - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: as directed by Departmental Representative.



- .1 Upon completion of: excavation, foundation, framing and services before concealment, of Work, and as directed by Departmental Representative.

**1.08 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**

**2.01 NOT USED**

**3 EXECUTION**

**3.01 NOT USED**

**END OF SECTION**



## 1 GENERAL

### 1.01 PURPOSE

- .1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

### 1.02 DEFINITIONS

- .1 "Contraband" means:
  - .1 an intoxicant, including alcoholic beverages, drugs and narcotics,
  - .2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,
  - .3 an explosive or a bomb or a component thereof,
  - .4 currency over any applicable prescribed limit \$25,00,
  - .5 any item not described in paragraphs (a) to (d) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
- .2 "Unauthorized Smoking Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing or snuffing tobacco, cigarette making machines, matches and lighters.
- .3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
- .4 "CSC" means Correctional Service Canada.
- .5 "Director" means Director or Warden of the Institution as applicable or their representative.
- .6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .7 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.
- .8 "Construction zone" means the area as shown on the contract drawings where the contractor will be allowed to work. This area may or may not be isolated from the security area of the institution.
- .9 Construction zone is located inside and outside the secured detention perimeter and includes the CFF site, the tunnels and buildings 1 and C15.

### 1.03 PRELIMINARY PROCEEDINGS

- .1 Prior to the commencement of work, the contractor shall meet with the Director to:
  - .1 Discuss the nature and extent of all activities involved in the Project.
  - .2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.

- .2 The contractor will:
  - .1 Ensure that all construction employees are aware of the CSC security requirements.
  - .2 Ensure that a copy of the CSC security requirements is always prominently on display at the job site.
  - .3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

#### 1.04 CONSTRUCTION EMPLOYEES

- .1 Submit to the Director a list of the names with date of birth of all construction employees and sub-trade employees to be employed on the construction site and a security clearance form for each employee.
- .2 Allow two (2) weeks for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at the institution where the project is taking place.
- .3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the construction employees clothing at all time while employees are at the institution.
- .4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.
- .5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
  - .1 appear to be under the influence of alcohol, drugs or narcotics.
  - .2 behave in an unusual or disorderly manner.
  - .3 are in possession of contraband.
- .6 Presence registries
  - .1 All construction and sub-trade employees to visit the site shall register their presence at the main guard station in building 1.
  - .2 All construction and sub-trade employees visiting the site more than once, after construction has begun, may register their presence in building C15 registry.

#### 1.05 VEHICLES

- .1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the Departmental Representative or an employee of the company that owns the vehicle.
- .2 The director may limit at any time the number and type of vehicles allowed within the Institution.
- .3 Drivers of delivery vehicles for material required by the project shall not require security clearances but

must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or Commissionaires while in the Institution. Delivery personnel are subject to security investigation.

- .4. If the Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter must be locked when not in use.

#### **1.06 PARKING**

- .1 The parking area(s) to be used by construction employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

#### **1.07 SHIPMENTS**

- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the institution's own shipments. The contractor must have his own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material equipment or tools for the contractor.

#### **1.08 TELEPHONES**

- .1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the institution unless prior approval of the Director is received.
- .2 The Director will ensure that approved telephones, Facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an Internet connection to unauthorized personnel.
- .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, BlackBerries, telephone used as 2-way radios, are not permitted within the perimeter of the Institution unless approved by the Director. Wireless cellular telephones are permitted within vehicles for the contractor's supervisor, the user will not permit their use by any inmate.
- .4. The Director may approve but limit the use of two way radios.
- .5 Cellular and digital telephones and two-way radios are permitted under certain conditions only. For example, their usage may be banned in areas accessible to prisoners.

#### **1.09 WORK HOURS**

- .1 Work hours within the Institution are: Monday to Friday 7 h a.m. to 16 h p.m.
- .2 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waived by the Director.

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#### 1.10 OVERTIME WORK

- .1 No overtime work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such the completion of a concrete pour or work to make the construction safe and secure, the contractor shall advise the Director as soon as this condition is known and follow the directions given by the Director. Costs to Canada for such events may be attributed to the contractor.
- .2 When overtime work, weekend statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his designate, to maintain the security surveillance. The actual cost of this extra staff may be attributed to the contractor.

#### 1.11 TOOLS AND EQUIPMENT

- .1 Maintain on site a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.
- .2 Obtain from the establishment a list of restricted and prohibited equipment.
- .3 Throughout the construction project maintain an up-to-date list of tools and equipment specified above.
- .4 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.
- .5 Store all tools and equipment in approved secure locations.
- .6 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor.
- .7 Scaffolding shall be secured and locked when not erected and when erected, shall be secured in a manner agreed upon with the director.
- .8 All missing or lost tools or equipment shall be reported immediately to the Director.
- .9 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:
  - .1 At the beginning and conclusion of every construction project.
  - .2 Weekly, when the construction project extends longer than a one week period.
  - .3 Remove tools and equipment from work area every day.
- .10 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.
- .11 If propane or natural gas is used for heating the construction, the institution will require that an employee of the contractor supervise the construction site during non-working hours.

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## 1.12 KEYS

- .1 Security Hardware Keys
  - .1 The Contractor shall arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).
  - .2 The SMO will provide a receipt to the Contractor for security hardware keys.
  - .3 The contractor will provide a copy of the above-mentioned receipt to the Departmental Representative.
- .2 Other Keys
  - .1 The contractor will use standard construction cylinders for locks for his use during the construction period.
    - .1 The contractor will issue instructions to his employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.
  - .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
    - .1 Prepare an operational keying schedule;
    - .2 accept the operational keys and cylinders directly from the lock manufacturer;
    - .3 Arrange for removal and return of the construction cores and install the operational core in all locks.
  - .4 Upon putting operational security keys into use, the CSC construction escort shall obtain these keys as they are required from the SMO and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the CSC construction escort.

## 1.13 SECURITY HARDWARE

- .1 Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.

## 1.14 PRESCRIPTION DRUGS

- .1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

## 1.15 SMOKING RESTRICTIONS

- .1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.
- .2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.
- .3 Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.

**1.16 CONTRABAND**

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.
- .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.
- .3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
- .4. Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

**1.17 SEARCHES**

- .1 All vehicles and persons entering institutional property may be subject to search.
- .2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband or unauthorized items, he may order that person to be searched.
- .3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

**1.18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL PROPERTY**

- .1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

**1.19 MOVEMENT OF VEHICLES**

- .1 Escorted commercial vehicles will be allowed to enter or leave the institution through the vehicle access gate during the following hours:
  - .1 07:45 hrs. to 11:00 hrs.
  - .2 13:00hrs to 15:30 hrs.
- .2 Construction vehicles shall not leave the Institution until an inmate count is completed.
- .3 The contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.
- .4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or Commissionaires working under the authority of the Director.
- .5 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.



- .6 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution.
- .7 Private vehicles of construction employees will not be allowed within the security perimeter of medium or maximum security institutions without the authorization of the Director.
- .8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.
- .9 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another fixed object.

#### 1.20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

- .1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.
- .2 However, notwithstanding paragraph above, the Director may:
  - .1 Prohibit or restrict access to any part of the institution.
  - .2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when escorted by a member of the CSC security staff or a commissionaire.
- .3 During the lunch and coffee/health breaks, all construction employees will remain within the construction site. Construction employees are not permitted to eat in the officer's lounge or the dining room of the institution.

#### 1.21 SURVEILLANCE AND INSPECTION

- .1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.
- .2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

#### 1.22 STOPPAGE OF WORK

- .1 The director may order at any time that the contractor, his employees, sub-contractors and their employees to not enter or to leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the CSC staff member giving this instruction, the time of the request and obey the order as quickly as possible.
- .2 The contractor shall advise the Departmental Representative of this interruption of the work within 24 hours.

**1.23 CONTACT WITH INMATES**

- .1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any construction employee doing any of the above will be removed from the site and his security clearance revoked.
- .2 It is to be noted that cameras are not allowed on CSC property.
- .3 Notwithstanding the above paragraph, if the director approves of the usage of cameras, it is strictly forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

**1.24 COMPLETION OF CONSTRUCTION PROJECT**

- .1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

**END OF SECTION**

## **1 GENERAL**

### **1.1 HEALTH AND SAFETY REQUIREMENTS**

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

### **1.2 REFERENCES**

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

### **1.3 SUBMITTALS**

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

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

#### 1.4 HAZARDS ASSESSMENT

- .1 The contractor must identify all hazards inherent in each task to be carried out at the site.

- .2 The contractor must plan and organize work so as to eliminate hazards at source or promote mutual protection so that reliance on individual protective gear can be kept to a minimum. Where individual protection against falling is required, workers shall use safety harness that meets standard Can - CSA- Z-259.10 - M90. Safety belts shall not be used as protection against falling.
- .3 Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.
- .4 All mechanical equipment shall be inspected before delivery to the site. Before using any mechanical equipment, submit to Departmental Representative a certificate of compliance signed by a qualified mechanic. Whenever he suspects a defect or accident risk, Departmental Representative may at any time order the immediate shut-down of equipment and require a new inspection by a specialist of his own choosing.
- .5 For use of equipment for lifting persons or materials, ensure that the inspections required by the standards are met and be able to provide a copy of certificates of inspection upon request of Representative of the Ministry.

#### **1.5 MEETINGS**

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

#### **1.6 LEGAL AND REGULATORY REQUIREMENTS**

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

#### **1.7 SITE-SPECIFIC CONDITIONS**

- .1 At the site, the contractor must take account of the following specific conditions:
  - .1 Restricted access to workers and authorized personal by the CSC (see section 01 35 13 – Special Project Procedures for Correctional Service Canada Security Requirements).
  - .2 Keep work area fenced-in and secure at all times.

- .3 Supply adequate temporary lighting for work area to facilitate area supervision by guards and security patrol.

## **1.8 SAFETY AND HEALTH MANAGEMENT**

- .1 Acknowledge and assume all the tasks and obligations which customarily devolve upon a principal Contractor under the terms of the Act Respecting Occupational Health and Safety (R.S.Q., chapter S-2.1) and the Construction Safety Code (S-2.1, r.4).
- .2 Develop a site-specific safety program based on the hazards identified and apply it from the start of project work until close-out is completed. The safety program must take account of all information appearing in 1.7 and must be submitted to all parties concerned, in accordance with the provisions set forth in 1.3. At a minimum, the site-specific safety program must include :
  - .1 Company safety and health policy.
  - .2 A description of the work, total costs, schedule and projected workforce curve.
  - .3 Flow chart of safety and health responsibility.
  - .4 The physical and material layout of the site.
  - .5 First-aid and first-line treatment standards.
  - .6 Identification of site-specific hazards.
  - .7 Risk assessment for the tasks to be carried out, including preventive measures and the procedures for applying them.
  - .8 Training requirements.
  - .9 Procedures in case of accident/injury
  - .10 Written commitment from all parties to comply with the prevention program.
  - .11 A site inspection schedule based on the preventive measures.
- .3 The contractor must draw up an effective emergency plan based on the characteristics and constraints of the site and its surroundings. Submit the emergency plan to all parties concerned, pursuant to the provisions of 1.3. The emergency plan must include:
  - .1 Evacuation procedure;
  - .2 Identification of resources (police, firefighters, ambulance services, etc.);
  - .3 Identification of persons in charge at the site;
  - .4 Identification of those with first-aid training;
  - .5 Training required for those responsible for applying the plan;
  - .6 Any other information needed, in the light of the site characteristics.

## **1.9 RESPONSIBILITIES**

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

## **1.10 COMMUNICATIONS AND POSTING**

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

## **1.11 UNFORESEEN CIRCUMSTANCES**

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

### **1.12 HEALTH/SAFETY/HYGIENE/ENVIRONMENTAL SPECIALISTS**

- .1 As soon as work starts, hire a safety officer, pursuant to the provisions of sections 2.5.3 and 2.5.4 of the Construction Safety Code (S-2.1, r. 6) and give him/her/them the necessary authority to carry out the duties of this position, including authority to stop work on safety and health grounds.
- .2 As of work starts, hire a qualified person whose duties will be to ensure compliance with and application of all legislation, regulations and standards and all contractual requirements pertaining to multidisciplinary works.
- .3 Provide this person with the authority, resources and tools needed for performance of his/her duties.
- .4 The person selected shall meet the following requirements:
  - .1 Obtain security clearance from CSC.
  - .2 Possesses a qualified certification for construction site security.
- .5 The person selected shall:
  - .1 have in-depth knowledge of legislation and regulations applicable to the site pertaining to multidisciplinary works.
  - .2 develop and disseminate a safety orientation program for all site workers.
  - .3 ensure that no worker is admitted to the site without having taken the safety orientation program and met all the training requirements of the applicable legislation and the site-specific safety program (see section 01 35 13- Special Project Procedures for Correctional Service Canada Security Requirements).
  - .4 inspect the work and ensure compliance with all regulatory requirements and those of the contract documents or the site-specific safety program.
  - .5 keep a daily log of actions taken and submitting a copy to Departmental Representative each week.

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

- .1 Inspect the work site and complete the site inspection sheet at least once a day.
- .2 Immediately take all necessary measures to correct any lapses from legislative or regulatory requirements and any hazards identified by a government inspector, by the Departmental Representative, by the site safety and health coordinator or during routine inspections.
- .3 Submit to Departmental Representative written confirmation of all measures taken to correct lapses and hazardous situations.
- .4 Give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order interruption and resuming of work as and when deemed necessary or desirable in the interests of safety and health. This person should always act so that the safety and health of the public and site workers and environmental protection take precedence over cost and scheduling considerations.



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

#### **1.14 BLASTING**

- .1 Blasting and other use of explosives are forbidden unless authorized in writing by Departmental Representative.
- .2 Any operation involving explosives must be carried out under the supervision of a qualified shot firer.
- .3 The purchase, carriage, storage and use of explosives must comply with all applicable federal and provincial legislation:
  - .1 Canada: Explosives Act (E-17), Explosives Regulations (C.R.C. CH. 599), Standard for Storage of Blasting Charges and Detonators, Transportation of Dangerous Goods Act and Regulations.
  - .2 Quebec: Explosives Act (E-22), Explosives Regulations (E-22, r.1), Safety Code for the Construction Industry (S-2.1, r.4), Transportation of Dangerous Goods Regulations.
- .4 Contractor shall obtain all permits required pursuant to the legislation and regulations referred to above and keep copies on hand at the site.
- .5 Contractor shall facilitate inspection of the site, stored explosives and vehicles used to transport explosives by any government representatives or police officers whose jurisdiction encompasses explosives.

#### **1.15 POWDER ACTUATED DEVICES**

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

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

- .1 Definitions:
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
- .2 Reference Standards:
  - .1 U.S. Environmental Protection Agency (EPA)/Office of Water
    - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Prior to commencing construction activities or delivery of materials to site, provide Environmental Protection Plan for review and approval by Departmental Representative.
- .2 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Include in Environmental Protection Plan:
  - .1 Name of person responsible for ensuring adherence to Environmental Protection Plan.
  - .2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.
  - .3 Name and qualifications of person responsible for training site personnel.
  - .4 Descriptions of environmental protection personnel training program.

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

#### **1.04 FIRES**

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

#### **1.05 DRAINAGE**

- .1 Provide Erosion and Sediment Control Plan identifying type and location of erosion and sediment controls provided. Ensure plan includes monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3 requirements.

- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

#### **1.06 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, 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. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.

#### **1.07 POLLUTION CONTROL**

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

#### **1.08 HISTORICAL/ARCHAEOLOGICAL CONTROL**

- .1 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

## **1.09 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 and Departmental Representative.
  - .1 Do not take action until after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

## **2 PRODUCTS**

### **2.01 NOT USED**

## **3 EXECUTION**

### **3.01 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

- .1 Not Used.

### **1.03 INSPECTION**

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

### **1.04 INDEPENDENT INSPECTION AGENCIES**

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

### **1.05 ACCESS TO WORK**

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

## **1.06 PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

## **1.07 REJECTED WORK**

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

## **1.08 REPORTS**

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

## **1.09 TESTS AND MIX DESIGNS**

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

## **1.10 MILL TESTS**

- .1 Submit mill test certificates as requested and required of specification Sections.

## **1.11 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to Divisions Mechanical and Electrical for definitive requirements.



**2 PRODUCTS**

**2.01 NOT USED**

**3 EXECUTION**

**3.01 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 PRECEDENCE**

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specifications in other Divisions of this Project Manual.

### **1.02 RELATED REQUIREMENTS**

- .1 Section 02 41 13 – Selective Site Demolition.

### **1.03 REFERENCES**

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
  - .1 ASHRAE 62-2001, Ventilation for Acceptable Indoor Air Quality.
  - .2 ASHRAE 52.2-1999, Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size.
  - .3 ASHRAE 129-1997, Measuring-Air Change Effectiveness.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-92.1-1989, Sound Absorptive Prefabricated Acoustical Units.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA-A440.1-2000, Windows - User Selection Guide.
- .4 Environmental Choice Program
  - .1 CCD-016-97, Thermal Insulation.
  - .2 CCD-017-98, Acoustical Products.
  - .3 CCD-025-01, Commercial Modular Carpet.
  - .4 CCD-026-01, Commercial Non-modular Carpet.
  - .5 CCD-029-95, Water Conserving Products.
  - .6 CCD-045-95, Sealant and Caulking Compounds.
  - .7 CCD-046-95, Adhesives.
  - .8 CCD-047-98, Surface Coatings.
  - .9 CCD-048-95, Surface Coatings - Recycled Water-Bourne.
- .5 National Air Duct Cleaners Association (NADCA)
  - .1 NADCA ACR-2002, Assessment Cleaning and Restoration.
  - .2 NADCA 05-1997, Requirements for the Installation of Service Openings in HVAC Systems.
- .6 Sheet Metal and Air Conditioning National Contractors Association (SMACNA)
  - .1 SMACNA IAQ Guideline for Occupied Buildings Under Construction, 1995.

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

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

- .2 Material Safety Data Sheets (MSDS)
  - .1 Submit Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures for the following products. Indicate VOC emissions, prior to installation or use:
    - .1 Adhesives.
    - .2 Caulking compounds.
    - .3 Sealants.
    - .4 Insulating materials.
    - .5 Fireproofing or fire stopping materials.
    - .6 Paints.
    - .7 Floor and wall patching or levelling materials.
    - .8 Lubricants.
    - .9 Clear finishes for wood surfaces.
  - .2 MSDS sheets to comply with Occupational Health and Safety requirements.
- .3 Construction Schedule
  - .1 Submit schedule of construction in accordance with Section 01 33 00 - Submittal Procedures, prior to start of work, in coordination with scheduling requirements, including:
    - .1 Sequence of finish applications and allowances for curing times.
    - .2 Identification of finish types. See Table A
    - .3 Schedule and duration of proposed temporary ventilation.
    - .4 Delivery schedules of manufactured materials which are anticipated to off-gas in timely manner, which will allow for airing of those materials prior to their scheduled installation.
    - .5 Indicate and schedule commissioning procedures and temporary usages of building mechanical systems, identifying types of filtration and schedule for filter replacement.
- .4 IAQ Management Plan
  - .1 Submit Indoor Air Quality (IAQ) Management Plan in accordance with Section 01 33 00 - Submittal Procedures, for construction and preoccupancy phases of building.
- .5 EcoLogo Labelled Products
  - .1 Submit of list of EcoLogo products and services proposed for this project in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit list of proposed non-endorsed products and services to Departmental Representative for review.

## 1.05 HAZARDOUS MATERIALS

- .1 Follow methods and procedures specified in Section 02 81 01 - Hazardous Materials; Section 02 50 13 - Management of Toxic Waste .
- .2 Take measures to ensure chemical spills do not enter drains.
- .3 Provide proper storage and containment of hazardous Materials.

- .1 Design and construction of storage spaces for hazardous materials in accordance with NBC and local building and fire codes.
- .2 Provide ventilation of areas, which contain potential sources of air contamination. Comply with standards for storage of flammable, combustible and hazardous materials, explosives, compressed gas cylinders, and reactive, corrosive and oxidizing materials.
- .3 Storage conditions, ventilation requirements, construction materials storage areas, containers, drums and tanks, compatibility issues, and labelling: in accordance with federal and municipal guidelines supplemented as follows:
  - .1 Confine storage of chemicals and hazardous wastes to designated areas with security of access.
  - .2 Provide access to hose bib and water for mixing concentrated chemicals.
  - .3 Provide containment to prevent spills from entering drains.
  - .4 Provide venting to exterior.
  - .5 Keep storage areas under negative pressure, where possible.

#### **1.06 EROSION AND SEDIMENTATION CONTROL**

- .1 Follow methods and procedures specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Establish long-term soil stabilization program as indicated.
- .3 Take measures to prevent loss of soil by storm water runoff.
- .4 Protect stockpiled topsoil.

#### **1.07 REDUCING SITE DISTURBANCES**

- .1 When building is to be on previously undeveloped site comply with following requirements:
  - .1 Avoid major alterations to sensitive topography, vegetation and wildlife habitat in areas indicated.
  - .2 Create traffic patterns, that cause minimum site disruptions, as per Departmental Representative's approval.
- .2 Minimize disturbances to watershed using site water management measures to ensure that watersheds and groundwater will be preserved.
- .3 Construct and erect erosion barriers to locations indicated and as directed by Departmental Representative.
- .4 Take measures to avoid soil compaction.
- .5 Re-grade and plant vegetation.

#### **1.09 BUILDING ENVELOPE**

- .1 Provide insulation to optimize reduction of heat losses or heat gains through building envelope.
  - .1 Insulation to levels specified in Model National Energy Code (MNEC).

- .2 Maintain integrity of building envelope using air barriers and vapour retarders and avoid thermal bridging to provide thermal comfort and prevent condensation.
  - .1 Air barrier: to NBC 1990, Article 5.3.
  - .2 Air leakage through air barrier system within roof area: not to exceed 0.15 l/s\*m<sup>2</sup> @ 75 Pa.
  - .3 Air leakage through air barrier system within roof area: not to exceed 0.15 l/s\*m<sup>2</sup> @ 75 Pa.
  - .4 Air leakage through air barrier system within area of exterior walls (excluding window): not to exceed 0.30 l/s\*m<sup>2</sup> @ 75 Pa.
  - .5 Air leakage through floor: not to exceed 0.10 l/s\*m<sup>2</sup> @ 75 Pa.
  - .6 Air leakage through windows: not to exceed limits specified in CSA-A440.1.

## 1.10 INDOOR AIR QUALITY

- .1 Provide moisture control methods within building to prevent mould growth.
- .2 IAQ Performance
  - .1 Comply with following minimum indoor air performance requirements. Total volatile organic compounds level requirements include formaldehyde:
    - .1 Total Volatile Organic Compounds Emissions Rate Standard:
      - .1 Product emission rate measured in mg/m<sup>2</sup> /hr.
    - .2 Indoor air concentration levels greater than 0.5 mg/m<sup>3</sup> of total volatile organic compounds at anticipated loading 30 days after installation.
    - .3 4-Phenyl Cyclohexene (4-PC) Emission Rate Standard:
      - .1 Product emission rate measured in mg/m<sup>2</sup> /hr.
      - .2 Indoor air concentration levels greater than 1 ppb at anticipated loading 30 days after installation.
  - .2 Provide ventilation rates in accordance with ASHRAE 62.
  - .3 Indoor Environmental Quality
    - .1 Reduce quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort as indicated.
    - .2 Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.
    - .3 Minimize cross-contamination of regularly occupied occupancy areas by chemical pollutants.
      - .1 Provide drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.
      - .2 Comply with recommended measures in MSDS sheets to protect health and safety of personnel.
- .3 Construction IAQ Management Plan
  - .1 Develop and implement Indoor Air Quality (IAQ) Management Plan for construction and preoccupancy phases of building as follows:
    - .1 During construction: meet or exceed minimum requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.
    - .2 Protect stored on-site or installed absorptive materials from moisture damage.
    - .3 Replace filtration media immediately prior to occupancy.

- .1 Filtration media: in accordance with ASHRAE 52.2, Minimum Efficiency Reporting Value (MERV) of 13.
- .4 Conduct minimum 2 week building flush-out with new filtration media at 100% outside air after construction ends and prior to occupancy.
  - .1 Test contaminant levels in building.
- .5 Adopt IAQ management plan during construction procedures, including:
  - .1 Protection of HVAC system during construction to control pollutant sources, and interrupt pathways for contamination.
  - .2 Sequencing of materials installation to ensure dissipation of high emissions from finishes that off-gas unacceptably high quantities of potentially harmful materials during curing to avoid contamination of absorptive materials.
  - .3 Apply Type 1 interior finishes and allow these finishes to completely cure according to intervals and times stated in respective finish manufactures printed instructions before commencing installation of any Type 2 materials in same area.
  - .4 Do not store any Type 2 materials in areas where installation or curing of Type 1 materials is in progress.
  - .5 Table A

#### Type 1 – Materials

Type 1 materials and and Finishes finishes include, Materials and but are not limited finishes which have to the following: potential for short term levels of off-gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing Composite wood products, including particleboard and plywood from which millwork, wood paneling, doors or furniture may be fabricated. Adhesives, sealants and glazing compounds. Wood preservatives, wood finishes, primers and paints and paint like wall finishes. Control and/or expansion joint fillers, firestopping materials and caulking. Hard finishes requiring adhesives installation including, but not limited to plastic laminate, linoleum and rubber tile. Gypsum board and associated finish processes and products.

#### Type 2 – Materials

Type 2 materials and and Finishes Soft finishes include, materials and but are not limited finishes which are to the following: woven, fibrous, or porous in nature and may absorb chemicals off-gassed by Type 1 materials and finishes, or may be adversely affected by airborne particulate. These materials have the potential to become 'sinks' for deleterious substances which may be released much later, or act as collectors of contaminants that may promote subsequent bacterial growth. Carpet and underpadding, and other woven or fibrous floor finishes. Fabric wall coverings. Insulation materials exposed to the airstream. Acoustic ceiling materials. Furnishings with fabric coverings.

- .6 Erect appropriate noise and dust barriers where demolition or construction procedures are to occur adjacent to occupied space.
    - .1 Take necessary steps to minimize interference with occupants.
- .4 Environmental Tobacco Smoke (ETS) Control
  - .1 Smoking will be permitted in building.
  - .2 Provide designated smoking room as indicated.
    - .1 Exhaust directly to outdoors.
    - .2 Enclose with impermeable structural deck-to-deck partitions.
  - .3 Provide negative pressure minimum 7 Pa when compared with surrounding spaces.
  - .4 Provide fresh air ventilation: to ASHRAE 129, rate of 24-32 litres/second/person.
- .5 Carbon Dioxide (CO<sub>2</sub>) Monitoring
  - .1 Provide carbon dioxide detectors to assess and monitor air quality and ventilation rates.
    - .1 Acceptable levels:
      - .1 Average concentration of 600-800 parts per million (PPM) CO<sub>2</sub>.
      - .2 Maximum continuous exposure limit of 1000 ppm.
  - .2 Provide 8 L/s of fresh air per person in open areas and 10 L/s of fresh air per person in closed offices to maintain CO<sub>2</sub> concentration at 1000 parts CO<sub>2</sub> per million parts of air or less.
- .6 Indoor Chemical and Pollution Storage
  - .1 Locate and install cooling towers as indicated.

## 1.12 GENERAL CONSTRUCTION MATERIALS/PRACTICES

- .1 Materials and Resources
  - .1 Use uncontaminated demolition materials for fill and hardcore and/or granular base.
  - .2 Incorporate reused building materials as indicated.
  - .3 Use products and services that meet criteria of EcoLogo guidelines.
  - .4 Provide list of non-endorsed products and services, provided the green labelled product or services are capable of meeting specified performance requirements.
- .2 Storage and Collection of Recyclables
  - .1 Provide separate storage/handling facilities for consumer recyclables including used paper, newspaper, newsprint, cardboard, glass, metal and plastic.
    - .1 Storage space area:
      - .1 Where building is more than 5,000 m<sup>2</sup> in area, provide minimum of 10 m<sup>2</sup>.
  - .2 Provide on-site centralized area for composting organic waste as indicated.
  - .3 Provide area for waste compactor, size and location as indicated.
- .3 Construction Waste Management
  - .1 Follow recommendations and requirements of this projects construction, renovation and demolition (CRD) waste management plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
  - .2 Local/Regional Materials



- .1 Use systems and materials having 25% of total percentage of products or materials manufactured within 1600 kilometers of project site.
- .3 Rapidly Renewable Materials
  - .1 Use systems and materials that originate from renewable sources.
- .4 Wood
  - .1 Use lumber sourced from independently certified well-managed forests in accordance with CSA or Forestry Stewardship Council.
  - .2 Materials made from composite wood materials or agricultural products: not contain urea-formaldehyde resins.
- .5 Durability
  - .1 Use durable building systems and materials:
    - .1 Requiring low maintenance (painting, retreatment, and waterproofing).
    - .2 Having minimal environmental impact.

### 1.13 INSULATION

- .1 Utilize insulation materials meeting following requirements:
  - .1 Board-type thermal insulation materials must contain, when calculated on 12-month rolling basis:
    - .1 Over 35% recycled material by weight of finished product if made from glass fibre.
    - .2 Over 45% recycled material by weight of finished product if made from mineral composition.
  - .2 Loose-fill and spray-on thermal insulation materials must contain, when calculated on 12-month rolling basis:
    - .1 Over 75% recycled material by weight of finished product, if made from cellulose fibre.
    - .2 Over 35% recycled material by weight of finished product if made from glass fibre.
    - .3 Over 50% recycled material by weight of finished product, if made from mineral wool.
- .3 Use insulation materials manufactured or installed that do not include CFC's.

### 1.14 PAINTS, STAINS, AND VARNISHES

- .1 Use paints and coatings that meet or exceed VOC limits established by Environmental Choice Programs guideline for water borne surface coatings CCD-047 and CCD-048.

### 1.15 SEALANTS, ADHESIVES AND COMPOUNDS

- .1 Use adhesives that meet or exceed VOC limits established by Environmental Choice Programs guideline for adhesives CCD-046.
- .2 Use sealant products that meet or exceed VOC limits established by Environmental Choice Programs guideline for sealants, CCD-045.

## **1.16 LIGHTING**

- .1 Lighting Fixtures
  - .1 Provide high efficiency lamps and luminaries with electronic ballasts. Lamps and luminaries to have following requirements:
    - .1 Fit electronic ballasts to luminaries.
    - .2 Provide task lighting as indicated.
    - .3 Provide personal controls as indicated.

## **1.17 ACOUSTIC CONTROL**

- .1 Use methods indicated to reduce noise levels including:
  - .1 Sound isolation.
  - .2 Building services noise and vibration control.

## **1.18 EXTERIOR SITE**

- .1 Storm water Management
  - .1 Take measures to prevent soil erosion before, during, and after construction by controlling storm-water runoff and wind erosion. Use:

## **2 PRODUCTS**

### **2.01 NOT USED**

## **3 EXECUTION**

### **3.01 NOT USED**

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 35 13 – Special Project Procedures for Correctional Service Canada Security Requirements.

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.03 INSTALLATION AND REMOVAL**

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

### **1.04 DEWATERING**

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

### **1.05 TEMPORARY POWER AND LIGHT**

- .1 Arrange for connection with Departmental Representative. Pay costs for installation, maintenance and removal.
- .2 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .3 Maximum power supply of 15 kVA, at 600 V, 3 phases, 60 Hz is available and will be provided for construction use at no cost. Connect to existing power supply in accordance with Canadian Electrical Code and provide meters and switching.
- .4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

### **1.06 TEMPORARY COMMUNICATION FACILITIES**

- .1 Provide and pay for temporary telephone, fax, data hook up, lines equipment necessary for own use.

### **1.07 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

- .2 Burning rubbish and construction waste materials is not permitted on site.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 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 sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 11 01 – Work Related General Information.

### **1.02 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
  - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

### **1.03 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation as well as waste dumpster areas. The new fenced area surrounding the contractors' site trailers shall be secured to prevent exterior access to the construction site as well as theft prevention; provide an intrusion alarm system and cameras and secure at all times all materials and tooling. This fenced construction area shall be exclusive to the new emergency generator construction project.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

### **1.04 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, platforms and temporary stairs.

### **1.05 HOISTING**

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

#### **1.06 SITE STORAGE/LOADING**

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

#### **1.07 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

#### **1.08 SECURITY**

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

#### **1.09 OFFICES**

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
- .4 Departmental Representative's, Clerk of Works' Site office.
  - .1 Provide temporary office for Departmental Representative, Departmental Representative and Clerk of Works.
  - .2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
  - .3 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.
  - .4 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10 % upward light component.
  - .5 Provide private washroom facilities adjacent to office complete with maintain supply of paper towels and toilet tissue.
  - .6 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
  - .7 Maintain in clean condition.

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

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

- .2 Locate only acceptable and permitted materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

#### **1.11 SANITARY FACILITIES**

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

#### **1.12 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Remove, upon completion of work, haul roads designated by Departmental Representative.

**1.13 CLEAN-UP**

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

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

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

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Not Used.

### **1.02 INSTALLATION AND REMOVAL**

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

### **1.03 RIGID TEMPORARY FENCES**

- .1 Site preparation
  - .1 The fence will be in straight lines from corner post to corner post to allow adequate viewing by security staff.
  - .2 Special attention must be paid to sloped sites to ensure gaps do not develop between the existing grade and the bottom of the fence. This "tight-fit" configuration under the fence has to be maintained throughout all the construction duration.
- .2 Fence dimension
  - .1 The height of the fence should be a minimum of 2275 mm high (7'-6") with a minimum panel width of 1200 mm (4') to a maximum of 3000 mm (10'). The gap between the bottom of the fence and the existing grade will not exceed 125 mm. The mounting plate should be fastened to the ground to deter causal lifting and movement. Joints between the fence panels should not exceed 125 mm and should be clamped at every joint top and bottom. The fence should be supported by a buttress 90° to the main fence every 9.0 m (30'). The buttress shall consist of a 1200 mm (4') fence panel, two fence clamps, one mounting base plate and two retaining spikes.
- .3 Security panel specifications
  - .1 Welded wire mesh wire which shall conform to the following specifications (see plate SP-6-3):
    - .1 Wire size: Minimum - 4.2 mm (6 gauge).
    - .2 Opening size: Maximum - width 50 mm and height 200 mm.
    - .3 Wire to be spot welded together at all wire joints.
    - .4 Wire to be spot welded to metal vertical and horizontal supports at every wire joint.
    - .5 Wire to be fabricated so that the vertical wire is spiked on the top and bottom (extend beyond the horizontal bars), also referred as "spiked security fence". Other "no climb" measure may be acceptable.
    - .6 Wire Breaking strength to be at least 10,000 N.
    - .7 The wire is preferably galvanized.
  - .2 Horizontal and vertical steel tube supports which shall conform to the following specifications (See plate SP-6-3):
    - .1 Supports (horizontal/vertical): Minimum - 1.3 mm (16 gauge), 32 mm (1.25") Square Steel tube.
    - .2 All joints shall be welded.

- .3 There will be a minimum of 2 horizontal and 2 vertical supports per panel.
- .4 The wire is preferably galvanized.
- .4 Mounting base specifications :
  - .1 The external dimensions of the steel plate shall be a minimum 10 mm (3/8") thick, 76 mm wide and 813 mm long.
  - .2 Two 300 mm x 25 mm tubular steel posts are welded in parallel relation to each other approximately 200 mm from one end of the steel plate and 25 mm from the edge. This provides securing two panels on one base. During installation, the vertical support of the panel slides over the steel post on the base.
  - .3 There shall be two 13 mm diameter holes, centered on the width approximately 25 mm from each end of the base plate. These holes must be dimensioned with enough tolerance to receive 12.5 mm diameter restraining spike.
  - .4 The extension of the mounting base must project on the construction side of the fence.
  - .5 The wire is preferably galvanized.
  - .6 Concrete mounting bases are not acceptable.
- .5 Spikes specifications
  - .1 The spike shall be a 12.5 mm diameter steel spike with a 50 mm head. 4.2.5.2 Spike length has to be determined by an engineer to prevent fence toppling and based on soil/rock condition.
  - .2 The spike is preferably galvanized.
- .6 Fence clamps specifications :
  - .1 The clamp consists of two plates with a carriage bolt and nut to tighten the plate together.
  - .2 The steel clamp plate shall be 12.5 mm thick, 51 mm wide and 152 mm long.
  - .3 There shall be one 13 mm diameter hole centered on each plate. This hole must be dimensioned with enough tolerance to receive a 12.5 mm diameter carriage bolt.
  - .4 The clamp plate shall be bent to a 15° angle, 32 mm from each end of the plate.
  - .5 The clamp is preferably galvanized.
- .7 Carriage clamp bolt specifications :
  - .1 The carriage clamp bolt shall be 12.5 mm diameter and 75 mm long. The nut shall be a 12.5 mm carriage bolt nut.
  - .2 The carriage clamp bolt are welded to one of the clamp plates so that the bolt can protrude through the other clamping plate and be tighten by the carriage nut. The Carriage nut must be on the construction side of the fence.
  - .3 The bolt and nut are preferably galvanized.
- .8 Gates or doors specifications
  - .1 The gates / doors consist of the typical fence panels as described above. The maximum width is 3000 mm.
  - .2 The gates/doors are of the swing type. Sliding gates are not required.
  - .3 The gates/doors must permit locking with chain and high security padlock. The padlocks are provided by the Institution. The gap between the fence and the gate/door or a double gate/door must not exceed 125 mm on both sides (lock side or swing side).

#### 1.04 GUARD RAILS AND BARRICADES

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

- .2 Provide as required by governing authorities.

#### **1.05 FIRE ROUTES**

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

#### **1.06 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

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

#### **1.07 PROTECTION OF BUILDING FINISHES**

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

#### **1.08 WASTE MANAGEMENT AND DISPOSAL**

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

### **2 PRODUCTS**

#### **2.01 NOT USED**

- .1 Not Used.

### **3 EXECUTION**

#### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

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

### **1.03 QUALITY**

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

### **1.04 AVAILABILITY**

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

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

#### **1.05 STORAGE, HANDLING AND PROTECTION**

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

#### **1.06 TRANSPORTATION**

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

#### **1.07 MANUFACTURER'S INSTRUCTIONS**

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

#### **1.08 QUALITY OF WORK**

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

#### **1.09 CO-ORDINATION**

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

#### **1.10 CONCEALMENT**

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

#### **1.11 REMEDIAL WORK**

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

#### **1.12 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

#### **1.13 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

#### **1.14 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

#### **1.15 PROTECTION OF WORK IN PROGRESS**

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

#### **1.16 EXISTING UTILITIES**

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

### **2 PRODUCTS**

#### **2.01 NOT USED**

### **3 EXECUTION**

#### **3.01 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
  - .1 Structural integrity of elements of project.
  - .2 Integrity of weather-exposed or moisture-resistant elements.
  - .3 Efficiency, maintenance, or safety of operational elements.
  - .4 Visual qualities of sight-exposed elements.
  - .5 Work of Owner or separate contractor.
- .3 Include in request:
  - .1 Identification of project.
  - .2 Location and description of affected Work.
  - .3 Statement on necessity for cutting or alteration.
  - .4 Description of proposed Work, and products to be used.
  - .5 Alternatives to cutting and patching.
  - .6 Effect on Work of Owner or separate contractor.
  - .7 Written permission of affected separate contractor.
  - .8 Date and time work will be executed.

### **1.02 MATERIALS**

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

### **1.03 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during piercing, cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work. Perform a local scan of existing foundation walls and tunnel walls to locate existing armature steel in order to avoid damaging it during piercing and cutting into walls for electrical conduit and cables passageway. Make holes and openings exclusively between armature steel grid.
- .3 Beginning of piercing, cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

## **1.04 EXECUTION**

- .1 Execute piercing, cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing .
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

## **1.05 WASTE MANAGEMENT AND DISPOSAL**

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

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

- .1 Not Used.

### **1.03 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including other than that caused by Departmental Representative or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .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 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

#### **1.04 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than including that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish hardware, stainless steel and mechanical and electrical fixtures.
- .8 Remove stains, spots, marks and dirt from electrical and mechanical fixtures, walls, and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .15 Sweep and wash clean paved areas.
- .16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Remove snow and ice from access to building.

#### **1.05 WASTE MANAGEMENT AND DISPOSAL**

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

**2 PRODUCTS**

**2.01 NOT USED**

**3 EXECUTION**

**3.01 NOT USED**

**END OF SECTION**





## **1 GENERAL**

### **1.01 WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Departmental Representative Waste Management Plan and Goals.
- .2 Departmental Representative Waste Management Goal 75 percent of total Project Waste to be diverted from landfill sites. Provide Departmental Representative documentation certifying that waste management, recycling#g, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Accomplish maximum control of solid construction waste.
- .4 Preserve environment and prevent pollution and environment damage.

### **1.02 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.03 REFERENCES**

- .1 Not Used.

### **1.04 DEFINITIONS**

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .3 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .4 Inert Fill: inert waste - exclusively asphalt and concrete.
- .5 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

- 
- .8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
  - .9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
    - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
    - .2 Returning reusable items including pallets or unused products to vendors.
  - .10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
  - .11 Separate Condition: refers to waste sorted into individual types.
  - .12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
  - .13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.
  - .14 Waste Management Co-ordinator (WMC) : contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
  - .15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

## 1.05 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
  - .1 Waste Audit.
  - .2 Waste Reduction Workplan.
  - .3 Material Source Separation Plan.
  - .4 Schedules A, B, C, D and E completed for project.

## 1.06 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
  - .1 Submit 2 copies of completed Waste Audit (WA): Schedule A.
  - .2 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.
  - .3 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.
  - .4 Submit 2 copies of Cost/Revenue Analysis Workplan (CRAW): Schedule D.

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

#### **1.07 WASTE AUDIT (WA)**

- .1 Conduct WA prior to project start-up.
- .2 Prepare WA: Schedule A.
- .3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

#### **1.08 WASTE REDUCTION WORKPLAN (WRW)**

- .1 Prepare WRW prior to project start-up.
- .2 WRW should include but not limited to:
  - .1 Destination of materials listed.
  - .2 Deconstruction/disassembly techniques and sequencing.
  - .3 Schedule for deconstruction/disassembly.
  - .4 Location.
  - .5 Security.
  - .6 Protection.
  - .7 Clear labelling of storage areas.
  - .8 Details on materials handling and removal procedures.
  - .9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.
- .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Describe management of waste.
- .5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.
- .6 Post WRW or summary where workers at site are able to review content.
- .7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

- .8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

#### **1.09 DEMOLITION WASTE AUDIT (DWA)**

- .1 Prepare DWA prior to project start-up.
- .2 Complete DWA: Schedule C.
- .3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

#### **1.10 COST/REVENUE ANALYSIS WORKPLAN (CRAW)**

- .1 Prepare CRAW: Schedule D.

#### **1.11 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)**

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated material in area which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
  - .1 Transport to approved and authorized recycling facility to users of material for recycling.
- .8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.
  - .1 Ship materials to site operating under Certificate of Approval.
  - .2 Materials must be immediately separated into required categories for reuse or recycling.

#### **1.12 WASTE PROCESSING SITES**

- .1 Province of: \_\_\_\_\_.
  - .1 Name: \_\_\_\_\_.
  - .2 Telephone: \_\_\_\_\_.
  - .3 Fax: \_\_\_\_\_.

### **1.13 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Provide waybills for separated materials.

### **1.14 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
  - .1 Number and size of bins.
  - .2 Waste type of each bin.
  - .3 Total tonnage generated.
  - .4 Tonnage reused or recycled.
  - .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

### **1.15 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.

- .2 Maintain security measures established by existing facility provide temporary security measures approved by Departmental Representative.

## **1.16 SCHEDULING**

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

## **2 PRODUCTS**

### **2.01 NOT USED**

## **3 EXECUTION**

### **3.01 APPLICATION**

- .1 Do Work in compliance with WRW.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

### **3.02 CLEANING**

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

### **3.03 DIVERSION OF MATERIALS**

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

---

|    |                       |                         |                    |
|----|-----------------------|-------------------------|--------------------|
| .3 | Demolition Waste:     |                         |                    |
|    | Material Type         | Recommended Diversion % | Actual Diversion % |
|    | Acoustic Tile         | 50                      |                    |
|    | Acoustical Insulation | 100                     |                    |
|    | Doors and Frames      | 100                     |                    |
|    | Electrical Equipment  | 80                      |                    |
|    | Mechanical Equipment  | 100                     |                    |
|    | Metals                | 100                     |                    |
|    | Rubble                | 100                     |                    |
|    | Wood (uncontaminated) | 100                     |                    |
|    | <u>Other</u>          |                         |                    |
| .4 | Construction Waste:   |                         |                    |
|    | Material Type         | Recommended Diversion % | Actual Diversion % |
|    | Cardboard             | 100                     |                    |
|    | Plastic Packaging     | 100                     |                    |
|    | Rubble                | 100                     |                    |
|    | Steel                 | 100                     |                    |
|    | Wood (uncontaminated) | 100                     |                    |
|    | Other                 | 100                     |                    |

3.04 WASTE AUDIT (WA)

.1 Schedule A - Waste Audit (WA):

| Material<br>Category              | Material<br>Quantity<br>(unit) | Estimated<br>Waste % | Total<br>Quantity<br>of Waste<br>(unit) | Generation<br>on Point | % Recycled | % Reused |
|-----------------------------------|--------------------------------|----------------------|---|------------------------|------------|----------|
| Wood and<br>Plastic<br>Material   |                                |                      |   |                        |            |          |
| Warped<br>Pallet<br>Forms         |                                |                      |   |                        |            |          |
| Plastic<br>Packaging              |                                |                      |   |                        |            |          |
| Cardboard<br>Packaging            |                                |                      |   |                        |            |          |
| Doors and<br>Windows<br>Materials |                                |                      |   |                        |            |          |
| Painted<br>Frames                 |                                |                      |   |                        |            |          |
| Glass                             |                                |                      |   |                        |            |          |
| Wood                              |                                |                      |   |                        |            |          |
| Metal                             |                                |                      |   |                        |            |          |
| Other                             |                                |                      |   |                        |            |          |



### 3.05 WASTE REDUCTION WORKPLAN (WRW)

#### .1 Schedule B:

| Material<br>Category              | Persons<br>Responsible | Total<br>Quantity of<br>Waste<br>(unit) | Reused<br>amounts<br>Projected<br>(units) | Recycled<br>amounts<br>Projected<br>(units) | % Waste | Material<br>Destination |
|-----------------------------------|------------------------|---|---|---|---------|-------------------------|
| Wood and<br>Plastic<br>Material   |                        |   |   |   |         |                         |
| Warped<br>Pallet<br>Forms         |                        |   |   |   |         |                         |
| Plastic<br>Packaging              |                        |   |   |   |         |                         |
| Cardboard<br>Packaging            |                        |   |   |   |         |                         |
| Doors and<br>Windows<br>Materials |                        |   |   |   |         |                         |
| Painted<br>Frames                 |                        |   |   |   |         |                         |
| Glass                             |                        |   |   |   |         |                         |
| Wood                              |                        |   |   |   |         |                         |
| Metal                             |                        |   |   |   |         |                         |
| Other                             |                        |   |   |   |         |                         |

3.06 DEMOLITION WASTE AUDIT (DWA)

.1 Schedule C - Demolition Waste Audit (DWA):

| Material<br>Description | Quantity | Unit | Total | Volume<br>(cum.) | Poids<br>(Cum.) | Remarks and<br>Assumptions |
|-------------------------|----------|------|-------|------------------|-----------------|----------------------------|
| Wood                    |          |      |       |                  |                 |                            |
| Wood Stud               |          |      |       |                  |                 |                            |
| Plywood                 |          |      |       |                  |                 |                            |
| Baseboard-wood          |          |      |       |                  |                 |                            |
| Door<br>Trim-wood       |          |      |       |                  |                 |                            |
| Wood Cabinet            |          |      |       |                  |                 |                            |
| Doors and<br>Windows    |          |      |       |                  |                 |                            |
| Panels Regular          |          |      |       |                  |                 |                            |
| Slab Regular            |          |      |       |                  |                 |                            |
| Wood Laminate           |          |      |       |                  |                 |                            |
| Byfold-Closet           |          |      |       |                  |                 |                            |
| Glazing                 |          |      |       |                  |                 |                            |

### 3.07 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

#### .1 Schedule D - Cost/Revenue Analysis Workplan (CRAW):

| Material<br>Description | Total<br>Quantity<br>(Unit) | Volume<br>(cum.) | Weight<br>(Cum.) | Disposal<br>Cost/Credit<br>\$(+/-) | Category<br>Sub-total<br>\$(+/-) | Cost \$(-)/<br>Revenue<br>\$(+) |
|-------------------------|-----------------------------|------------------|------------------|------------------------------------|----------------------------------|---------------------------------|
| Wood                    |                             |                  |                  |                                    |                                  |                                 |
| Wood Stud               |                             |                  |                  |                                    |                                  |                                 |
| Plywood                 |                             |                  |                  |                                    |                                  |                                 |
| Baseboard-wood          |                             |                  |                  |                                    |                                  |                                 |
| Door                    |                             |                  |                  |                                    |                                  |                                 |
| Trim-wood               |                             |                  |                  |                                    |                                  |                                 |
| Wood Cabinet            |                             |                  |                  |                                    |                                  |                                 |
| Doors and<br>Windows    |                             |                  |                  |                                    |                                  |                                 |
| Panels Regular          |                             |                  |                  |                                    |                                  |                                 |
| Slab Regular            |                             |                  |                  |                                    |                                  |                                 |
| Wood Laminate           |                             |                  |                  |                                    |                                  |                                 |
| Byfold-Closet           |                             |                  |                  |                                    |                                  |                                 |
| Glazing                 |                             |                  |                  |                                    |                                  |                                 |

### 3.08 MAIN FEDERAL AND PROVINCIAL ENVIRONMENTAL AUTHORITIES

Québec :       Ministère de l'Environnement et de la Faune,  
                    Siège social,  
                    150, boul. René-Lévesque Est,  
                    Québec QC  
                    G1R 4Y1  
                    418-646-5974 800-561-1616

Conseil de conservation et de l'environnement  
800, place d'Youville,  
19e étage  
Québec  
G1R 3P4  
418-643-3127  
418-643-3818

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 78 00 – Closeout Submittals.

### **1.02 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2 Request Departmental Representative inspection.
  - .2 Departmental Representative Inspection:
    - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
    - .2 Contractor to correct Work as directed.
  - .3 Completion Tasks: submit written certificates in French that tasks have been performed as follows:
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
    - .4 Certificates required by Fire Commissioner, Utility companies: submitted.
    - .5 Operation of systems: demonstrated to Owner's personnel.
    - .6 Commissioning of mechanical systems: completed in accordance with 01 91 13 - General Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Departmental Representative.
    - .7 Work: complete and ready for final inspection.
  - .4 Final Inspection:
    - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
    - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
  - .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
  - .7 Final Payment:
    - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
    - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
  - .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

**1.03 FINAL CLEANING**

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

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

- .1 Canadian Environmental Protection Act (CEPA)
  - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

### **1.03 ADMINISTRATIVE REQUIREMENTS**

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

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English and French.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

### **1.05 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.

- .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

#### **1.06 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

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

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.



- .4 Change Orders and other modifications to Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Field test records.
- .7 Inspection certificates.
- .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

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

- .1 Record information on set of blue line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

## **1.09 FINAL SURVEY**

- .1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

## **1.10 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
  - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
  - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 13 - General Commissioning (Cx) Requirements.

- .15 Aboveground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.
- .16 Additional requirements: as specified in individual specification sections.

#### **1.11 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

#### **1.12 MAINTENANCE MATERIALS**

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

### **1.13 DELIVERY, STORAGE AND HANDLING**

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

### **1.14 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month, 9 month, 12 month, 16 month and 21 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:

- 
- .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include the new generator.
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
  - .5 Procedure and status of tagging of equipment covered by extended warranties.
  - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
  - .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
  - .11 Written verification to follow oral instructions.
    - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

#### 1.15 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
  - .1 Type of product/material.
  - .2 Model number.
  - .3 Serial number.
  - .4 Contract number.

- .5 Warranty period.
- .6 Inspector's signature.
- .7 Construction Contractor.

**2 PRODUCTS**

**2.01 NOT USED**

**3 EXECUTION**

**3.01 NOT USED**

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 ADMINISTRATIVE REQUIREMENTS**

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative 's personnel two weeks prior to date of interim completion.
- .2 Departmental Representative: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
  - .1 Verify conditions for demonstration and instructions comply with requirements.
  - .2 Verify designated personnel are present.
  - .3 Ensure equipment has been inspected and put into operation in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements.
  - .4 Ensure testing, adjusting, and balancing has been performed [in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
  - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.
  - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
  - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
  - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:
  - .1 Division 26 - Electrical System: 8 hours of instruction.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.

- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

#### **1.04 QUALITY ASSURANCE**

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
  - .1 Instruct Departmental Representative's personnel.
  - .2 Provide written report that demonstration and instructions have been completed.

#### **2 PRODUCTS**

##### **2.01 NOT USED**

#### **3 EXECUTION**

##### **3.01 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 SUMMARY**

- .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Requirements
  - .1 Section 01 78 00 – Closeout Submittals.
- .3 Acronyms:
  - .1 AFD - Alternate Forms of Delivery, service provider.
  - .2 BMM - Building Management Manual.
  - .3 Cx - Commissioning.
  - .4 EMCS - Energy Monitoring and Control Systems.
  - .5 O&M - Operation and Maintenance.
  - .6 PI - Product Information.
  - .7 PV - Performance Verification.
  - .8 TAB - Testing, Adjusting and Balancing.

### **1.02 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
  - .2 Ensure appropriate documentation is compiled into the BMM.
  - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
  - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

### **1.03 COMMISSIONING OVERVIEW**

- .1 Cx to be a line item of Contractor's cost breakdown.

- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .4 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

#### **1.04 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

#### **1.05 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Departmental Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation shelf-ready.
  - .5 Understand completely design criteria and intent and special features.
  - .6 Submit complete start-up documentation to Departmental Representative.
  - .7 Have Cx schedules up-to-date.
  - .8 Ensure systems have been cleaned thoroughly.
  - .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.

- .10 Ensure "As-Built" system schematics are available.
- .11 Ensure that a standby emergency power supply is available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

#### **1.06 CONFLICTS**

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

#### **1.07 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 4 weeks after award of Contract:
    - .1 Name of Contractor's Cx agent.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.
  - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
  - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

#### **1.08 COMMISSIONING DOCUMENTATION**

- .1 Provide Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

#### **1.09 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.
  - .4 Training.

## **1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings: Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage. Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
  - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Contractor, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

## **1.11 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

## **1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days notice prior to commencement.
- .2 Departmental Representative to witness of start-up and testing.
- .3 .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

## **1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Factory testing: manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by Departmental Representative.
  - .3 Arrange for Departmental Representative to witness tests.
  - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.

- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### 1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures.
  - .3 Operational testing: document equipment performance.
  - .4 System PV: include repetition of tests after correcting deficiencies.
  - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document required tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
  - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
    - .1 Rejected equipment to be removed from site and replaced with new.

- .2 Subject new equipment/systems to specified start-up procedures.

#### **1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,
  - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

#### **1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

#### **1.17 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

#### **1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

#### **1.19 INSTRUMENTS / EQUIPMENT**

- .1 Submit to Departmental Representative for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

- .2 Provide the following equipment as required:
  - .1 2-way radios.
  - .2 Ladders.
  - .3 Equipment as required to complete work.

#### **1.20 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under actual or accepted simulated operating conditions, over entire operating range, in all modes.
  - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

#### **1.21 WITNESSING COMMISSIONING**

- .1 Departmental Representative to witness activities and verify results.

#### **1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

#### **1.23 COMMISSIONING CONSTRAINTS**

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

#### **1.24 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

## **1.25 EXTENT OF VERIFICATION**

- .1 Laboratory areas:
  - .1 Provide manpower and instrumentation to verify up to 100 % of reported results.
- .2 Elsewhere:
  - .1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.
- .3 Number and location to be at discretion of Departmental Representative.
- .4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .6 Perform additional commissioning until results are acceptable to Departmental Representative.

## **1.26 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Departmental Representative's approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Departmental Representative deems Contractor's request for second verification was premature.

## **1.27 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes which become apparent as Commissioning proceeds.
- .2 Perform static and operational checks as applicable and as required.

## **1.28 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Commissioning to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Commissioning to Departmental Representative in writing. Stop Commissioning until problems are rectified. Proceed with written approval from Departmental Representative.

## **1.29 COMPLETION OF COMMISSIONING**

- .1 Upon completion of Commissioning leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Commissioning specifications, complete Commissioning prior to issuance of Interim Certificate of Completion.



- .3 Commissioning to be considered complete when contract Commissioning deliverables have been submitted and accepted by Departmental Representative.

#### **1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

#### **1.31 TRAINING**

- .1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

#### **1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

#### **1.33 OCCUPANCY**

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

#### **1.34 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

#### **1.35 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

#### **1.36 DEPARTMENTAL REPRESENTATIVE'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

**2 PRODUCTS**

**2.01 NOT USED**

**3 EXECUTION**

**3.01 NOT USED**

**END OF SECTION**

## **1 GENERAL**

### **1.01 SUMMARY**

- .1 This Section specifies roles and responsibilities of Commissioning Training.
- .2 Related Requirements
  - .1 Section 01 91 13 - General Commissioning (Cx) Requirements.

### **1.02 TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Property Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

### **1.03 INSTRUCTORS**

- .1 Departmental Representative will provide:
  - .1 Descriptions of systems.
  - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
  - .1 Start-Up, operation, shut-down of equipment, components and systems.
  - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
  - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
  - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

### **1.04 TRAINING OBJECTIVES**

- .1 Training to be detailed and duration to ensure:
  - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
  - .2 Effective on-going inspection, measurements of system performance.
  - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
  - .4 Ability to update documentation.
  - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

## **1.05 TRAINING MATERIALS**

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
  - .1 "As-Built" Contract Documents.
  - .2 Operating Manual.
  - .3 Maintenance Manual.
  - .4 Management Manual.
  - .5 TAB and PV Reports.
- .3 Project Manager, Commissioning Manager and Property Manager will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
  - .1 Transparencies for overhead projectors.
  - .2 Multimedia presentations.
  - .3 Manufacturer's training videos.
  - .4 Equipment models.

## **1.06 SCHEDULING**

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be 3 hours in length.
- .3 Training to be completed prior to acceptance of facility.

## **1.07 RESPONSIBILITIES**

- .1 Be responsible for:
  - .1 Implementation of training activities,
  - .2 Coordination among instructors,
  - .3 Quality of training, training materials,
- .2 Departmental Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

## **1.08 TRAINING CONTENT**

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
  - .1 Review of facility and occupancy profile.
  - .2 Functional requirements.

- .3 System philosophy, limitations of systems and emergency procedures.
  - .4 Review of system layout, equipment, components and controls.
  - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
  - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
  - .7 Maintenance and servicing.
  - .8 Trouble-shooting diagnosis.
  - .9 Inter-Action among systems during integrated operation.
  - .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

#### **1.09 VIDEO-BASED TRAINING**

- .1 Manufacturer's videotapes to be used as training tool with Departmental Representative's review and written approval 3 months prior to commencement of scheduled training.
- .2 On-Site training videos:
  - .1 Videotape training sessions for use during future training.
  - .2 To be performed after systems are fully commissioned.
  - .3 Organize into several short modules to permit incorporation of changes.
- .3 Production methods to be professional quality.

### **2 PRODUCTS**

#### **2.01 NOT USED**

### **3 EXECUTION**

#### **3.01 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 SUMMARY**

- .1 Methods and procedures for demolishing, salvaging, recycling and removing sitework items designated to be removed in whole or in part, and for backfilling resulting trenches and excavations.
  - .2 Sustainable requirements for construction and verification.
- .2 Related Requirements
  - .1 Not Used.
- .3 Measurement Procedures.
  - .1 Measure removal of asphaltic concrete pavement in square metres for each thickness specified.
  - .2 Measure removal of Portland cement concrete pavement in square metres for each thickness specified.
  - .3 Measure removal of concrete and masonry foundations in cubic metres.
  - .4 Measure removal of fences in metres.
  - .5 Payment for salvage, disposal, alternative disposal, recycling, excavating backfilling and restoration will be included in above removal items.
  - .6 Measure removal of waste, materials designated for alternate disposal from the site in tonnes.

### **1.02 REFERENCES**

- .1 Canadian Council of Ministers of the Environment (CCME).
  - .1 PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .2 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
  - .2 Canadian Environmental Protection Act, 1999 (CEPA), c. 33.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

### **1.03 DEFINITIONS**

- .1 Demolition: rapid destruction of building following removal of hazardous materials.

- .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
- .3 Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.
  - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
  - .2 Indicates quantities of reuse, recycling and landfill.
- .4 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .5 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

#### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Coordinate submittal requirements and provide submittals required by Section 01 47 15 - Sustainable Requirements: Construction.
- .3 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials and Section 01 47 15 - Sustainable Requirements: Construction.
- .4 Shop drawings.
  - .1 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.
  - .2 Submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Quebec, Canada.
- .5 Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .6 Waste Reduction Workplan: prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate:
  - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
  - .2 Schedule of selective demolition.
  - .3 Number and location of dumpsters.
  - .4 Anticipated frequency of tippage.
  - .5 Name and address of haulers, waste facilities, waste receiving organizations.



- .7 Certificates: submit copies of certified weigh bills, bills of lading, receipts from authorized disposal sites and reuse and recycling facilities for material removed from site on weekly basis upon request of Departmental Representative.
  - .1 Written authorization from Departmental Representative is required to deviate from haulers, facilities, receiving organizations listed in Waste Reduction Workplan.

#### **1.05 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, TDGA and applicable Provincial regulations.
- .2 Site Meetings.
  - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart to:
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building subtrades.
    - .4 Review manufacturer's installation instructions and warranty requirements.
  - .2 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.
  - .3 Hold project meetings every week.
  - .4 Ensure key personnel, site supervisor, project manager, subcontractor representatives, WMC attend.
  - .5 Reporting Requirements: WMC to complete.
  - .6 WMC must provide written report on status of waste diversion activity at each meeting.
  - .7 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .3 Health and Safety.
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .4 Sustainable Requirements.
  - .1 Construction: in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- .1 Perform Work in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Store and manage hazardous materials in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .3 Storage and Protection.
  - .1 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

- .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.
- .3 Remove and store materials to be salvaged, in manner to prevent damage.
- .4 Store and protect in accordance with requirements for maximum preservation of material.
- .5 Handle salvaged materials as new materials.
- .4 Waste Management and Disposal.
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
  - .2 Divert excess materials from landfill to site approved by Departmental Representative.
  - .3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.
  - .4 Place materials defined as hazardous or toxic in designated containers.
  - .5 Handle and dispose of hazardous materials in accordance with CEPA Regional and Municipal, regulations.
  - .6 Label location of salvaged material's storage areas and provide barriers and security devices.
  - .7 Ensure emptied containers are sealed and stored safely.
  - .8 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, concrete and asphalt, and gypsum.
  - .9 Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

## 1.07 SITE CONDITIONS

- .1 Site Environmental Requirements.
  - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
  - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
  - .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
    - .1 Ensure proper disposal procedures are maintained throughout the project.
  - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
  - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities as directed by Departmental Representative.
  - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .2 Existing Conditions.
  - .1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction as directed by Departmental Representative from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements and Section 02 81 01 - Hazardous Materials.

## **1.08 SCHEDULING**

- .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
- .1 Notify Departmental Representative in writing when unforeseen delays occur.

## **2 PRODUCTS**

### **2.01 SUSTAINABLE REQUIREMENTS**

- .1 Materials and resources in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

### **2.02 EQUIPMENT**

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

## **3 EXECUTION**

### **3.01 PREPARATION**

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

### **3.02 REMOVAL OF HAZARDOUS WASTES**

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

### **3.03 REMOVAL OPERATIONS**

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Removal of Pavements, Curbs and Gutters:
  - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
  - .2 Protect adjacent joints and load transfer devices.
  - .3 Protect underlying and adjacent granular materials.

- .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.
- .5 Stockpile topsoil for final grading and landscaping.
  - .1 Provide erosion control and seeding if not immediately used.
- .6 Disposal of Material.
  - .1 Dispose of materials not designated for salvage or reuse on site as instructed by Departmental Representative at authorized facilities approved in Waste Reduction Workplan.
- .7 Backfill.
  - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### 3.04 STOCKPILING

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

### 3.05 REMOVAL FROM SITE

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

### **3.06 RESTORATION**

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work and/or match condition of adjacent, undisturbed areas.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

### **3.07 FIELD QUALITY CONTROL**

- .1 Verification requirements include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Wood.
  - .8 Low-emitting materials.

### **3.08 CLEANING**

- .1 Remove debris, trim surfaces and leave work site clean, upon completion of Work
- .2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 02 41 99 – Demolition for minor work.

### **1.02 REFERENCES**

- .1 Canadian Council of Ministers of the Environment (CCME)
  - .1 PN 1326-July 2005, Environmental Code of Practice for aboveground and underground tank systems containing petroleum products and allied petroleum products.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Provide shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Before proceeding with demolition of load bearing walls or of other walls and where required by authority having jurisdiction submit for review by Departmental Representative shoring and underpinning drawings prepared by qualified professional engineer registered or licensed in the Province of Quebec in Canada showing proposed method.
- .4 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate:
  - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
  - .2 Schedule of selective demolition.
  - .3 Number and location of dumpsters.
  - .4 Anticipated frequency of tippage.
  - .5 Name and address of waste facilities and waste receiving organizations.

### **1.04 DELIVERY, STORAGE AND HANDLING**

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

### **1.05 SITE CONDITIONS**

- .1 Review designated substance report and take precautions to protect environment.

- .2 Should material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
  - .1 Do not proceed until written instructions have been received from Departmental Representative.
- .3 Notify Departmental Representative.

## **2 PRODUCTS**

### **2.01 EQUIPMENT**

- .1 Leave equipment and machinery running only while in use, except where extreme temperatures prohibit shutting down.
- .2 Demonstrate that tools and machinery are being used in manner which allows for salvage of materials in best condition possible.

## **3 EXECUTION**

### **3.01 PREPARATION**

- .1 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Protection:
  - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services and equipment.
  - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .3 Post warning signs on electrical lines and equipment which must remain energized to serve other products during period of demolition.
- .4 Locate and protect utility lines. Do not disrupt active or energized utilities traversing premises and designated to remain undisturbed.

### **3.02 DEMOLITION SALVAGE AND DISPOSAL**

- .1 Remove parts of existing building to permit new construction. Sort materials into appropriate piles for reuse and recycling.
- .2 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .3 Remove items to be reused, store as directed by Departmental Representative, and re-install under appropriate section of specification.
- .4 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.



- .5 Dispose of removed materials, to appropriate recycling facilities and reuse facilities except where specified otherwise, in accordance with authority having jurisdiction.
- .6 *Fill and repair holes and openings as a result of dismantling and the removal of existing equipment and materials within the scope of this project.*

### **3.03 PARTIAL DEMOLITION OF STRUCTURES**

- .1 As per indications.

### **3.04 STOCKPILING**

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

### **3.05 REMOVAL FROM SITE**

- .1 Transport material designated for alternate disposal to approved facilities and receiving organizations listed in waste reduction workplan and in accordance with applicable regulations. Do not deviate from facilities and receiving organizations listed in waste reduction workplan without prior written authorization from Departmental Representative.
- .2 Dispose of materials not designated for alternate disposal in accordance with applicable regulations. Disposal facilities must be approved of and listed in waste reduction workplan. Do not deviate from disposal facilities listed in waste reduction workplan without prior written authorization from Departmental Representative.

### **3.06 CLEANING AND RESTORATION**

- .1 Keep site clean and organized throughout demolition procedure.
- .2 Upon completion of project, reinstate areas parking surfaces, affected by Work to condition which existed prior to beginning of Work, match condition of adjacent, undisturbed areas.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 74 21 – Construction/Demolition.

### **1.02 REFERENCES**

- .1 CSA International
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures and 01 74 21 - Construction/Demolition Waste Management Disposal.
- .2 Submit demolition drawings:
  - .1 Submit for review and approval by Departmental Representative shoring and underpinning drawings stamped and signed by professional Departmental Representative registered or licensed in the Province of Quebec, showing proposed method.
- .3 Before commencing work on site, submit a detailed waste reduction plan in accordance with section 01 74 21 – Construction/Demolition Waste Management and disposal, which includes the following information.
  - .1 Nature and quantity of waste material and material to be recuperated, reused, recycled or disposed of.
  - .2 Selective demolition work schedule.
  - .3 Number and location of recuperation dumpsters.
  - .4 Frequency of waste material removal.

### **1.04 SITE CONDITIONS**

- .1 Review "Designated Substance Report" and take precautions to protect environment.
- .2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
  - .1 Proceed only after receipt of written instructions have been received from Departmental Representative.
- .3 Notify Departmental Representative before disrupting building access or services.

## **2 PRODUCTS**

### **2.01 NOT USED**

## **3 EXECUTION**

### **3.01 EXAMINATION**

- .1 Inspect building and site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
  - .1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
  - .2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

### **3.02 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work..
- .2 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services and equipment.
  - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
  - .5 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.

- .3 Demolition/Removal:
  - .1 Remove items as indicated.
  - .2 Removal of Pavements, Curbs and Gutters:
    - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
    - .2 Protect adjacent joints and load transfer devices.
    - .3 Protect underlying and adjacent granular materials.
  - .3 Remove parts of existing building to permit new construction.
  - .4 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

### **3.03 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 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Code of Canada, 2005.
- .4 Transportation of Dangerous Goods Act (TDGA), 1999 c. 34.
- .5 Transportation of Dangerous Goods Regulations (TDGR), T-19.01-SOR/2003-400.
- .6 Storage of PCB Material Regulations, SOR/92-507.
- .7 PCB Waste Export Regulations, 1996, SOR/97-109.
- .8 Ozone-Depleting Substances Regulations, SOR/99-07.
- .9 Environmental Code of Practice on Halons, July 1996.
- .10 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, March 1996.

### **1.03 DEFINITIONS**

- .1 Toxic: substance is considered toxic if it is listed on Toxic Substances List found in Schedule 1 of CEPA.
- .2 List of Toxic Substances: found in Schedule 1 of CEPA, lists substances that have been assessed as toxic. Federal Government can make regulations with respect to a substance specified on List of Toxic Substances. Column II of this list identifies type of regulation applicable to each substance.
- .3 PCBs: includes chlorobiphenyls referred to in Column I of item 1 of the List of Toxic Substances in Schedule I of Canadian Environmental Protection Act.

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

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

- .2 Product Data:
  - .1 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
  - .2 Submit photocopy of shipping documents and waste manifests and export notices to Departmental Representative when shipping toxic wastes off site.
  - .3 Maintain 1 copy of product data in readily accessible file on site.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- .1 Store and handle toxic wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .2 Store and handle flammable and combustible wastes in accordance with current National Fire Code of Canada requirements.
- .3 Co-ordinate storage of toxic wastes with Departmental Representative and follow internal requirements for labelling and storage of wastes.
- .4 Observe smoking regulations, smoking is prohibited in area where toxic wastes are stored, used, or handled.
- .5 Only certified persons who have successfully completed Environment Canada Environmental Awareness Course for Environmentally Safe Handling of Refrigerants are permitted to work on refrigeration and air conditioning systems.
- .6 Report spills or accidents involving toxic wastes immediately to Departmental Representative and to appropriate regulatory authorities. Take reasonable measures to contain the release while ensuring health and safety is protected.
- .7 Transport toxic wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .8 Use authorized/licensed carrier to transport toxic waste.
- .9 Co-ordinate transportation and disposal of toxic wastes with Departmental Representative.
- .10 Notify appropriate regulatory authorities and obtain required permits and approvals prior to exporting toxic waste.
- .11 Dispose of toxic wastes generated on site in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .12 Ensure toxic waste is shipped to authorized/licensed treatment or disposal facility and that liability insurance requirements are met.
- .13 Minimize generation of toxic waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.



- .14 Identify and evaluate recycling and reclamation options as alternatives to land disposal in compliance with LEED credit MR 2, such as:
  - .1 Hazardous wastes recycled in manner constituting disposal.
  - .2 Hazardous waste burned for energy recovery.
  - .3 Lead-acid battery recycling.
  - .4 Hazardous wastes with economically recoverable precious metals.

## **2 PRODUCTS**

### **2.01 NOT USED**

## **3 EXECUTION**

### **3.01 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Not Used.

### **1.02 REFERENCES**

- .1 Definitions:
  - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
  - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
  - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .2 Reference Standards:
  - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
    - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
  - .2 Department of Justice Canada (Jus)
    - .1 Transportation of Dangerous Goods Act, 1992 (TDG Act) 1992, (c. 34).
    - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).
  - .3 Green Seal Environmental Standards (GS)
    - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
    - .2 GS-36-00, Commercial Adhesives.
  - .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
    - .1 Material Safety Data Sheets (MSDS).
  - .5 National Research Council Canada Institute for Research in Construction (NRC-IRC)
    - .1 National Fire Code of Canada-2005.
- .3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
  - .2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

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

- .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.
- .3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

#### 1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
  - .1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.
- .4 Storage and Handling Requirements:
  - .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
  - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
  - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.
  - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
    - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
    - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
  - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
  - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
  - .7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
  - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
  - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
  - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
    - .1 Store hazardous materials and wastes in closed and sealed containers.
    - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.

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- .3 Store hazardous materials and wastes in containers compatible with that material or waste.
  - .4 Segregate incompatible materials and wastes.
  - .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
  - .6 Store hazardous materials and wastes in secure storage area with controlled access.
  - .7 Maintain clear egress from storage area.
  - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
  - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
  - .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
  - .11 When hazardous waste is generated on site:
    - .1 Co-ordinate transportation and disposal with Departmental Representative.
    - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
    - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
    - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
    - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
    - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
    - .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
    - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.
    - .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.
  - .12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
  - .13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.
- 
- .5 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section.
  - .6 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Description:
  - .1 Bring on site only quantities hazardous material required to perform Work.
  - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

## **3 EXECUTION**

### **3.01 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
  - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
  - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
  - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
  - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
  - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
  - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
  - .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
    - .1 Hazardous wastes recycled in manner constituting disposal.
    - .2 Hazardous waste burned for energy recovery.
    - .3 Lead-acid battery recycling.
    - .4 Hazardous wastes with economically recoverable precious metals.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 03 20 00 – Concrete reinforcing.
- .2 Section 03 30 00 – Cast-in-place concrete.

### **1.02 REFERENCES**

- .1 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.
  - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
  - .4 CSA O151-04, Canadian Softwood Plywood.
  - .5 CSA O153-M1980(R2003), Poplar Plywood.
  - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
  - .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
  - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

### **1.03 DELIVERY, STORAGE AND HANDLING**

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

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.
  - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
  - .3 Rigid insulation board: to CAN/ULC-S701.
- .2 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.
- .3 Form ties:
  - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
  - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form release agent: low VOC.
- .5 Form stripping agent: colourless mineral oil, low VOC, free of kerosene.
- .6 Falsework materials: to CSA-S269.1.

## **3 EXECUTION**

### **3.01 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.



- .8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .9 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .10 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Construct forms for architectural concrete, and place ties as indicated and as directed.
  - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .14 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

### **3.02 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 2 days for walls and sides of beams.
  - .2 2 days for columns.
  - .3 12 hours for footings and abutments.
- .2 Remove formwork when concrete has reached 75 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

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

### **1.02 REFERENCES**

- .1 American Concrete Institute (ACI)
  - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
  - .1 ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - .2 ASTM A 143/A 143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - .3 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .4 ASTM A 775/A 775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International
  - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
  - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec of Canada.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.

- .2 Lists.
- .3 Quantities of reinforcement.
- .4 Sizes, spacings and locations of reinforcement, with identifying code marks to permit correct placement without reference to structural drawings.
- .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3.
  - .1 Provide type B tension lap splices.

#### **1.04 DELIVERY, STORAGE AND HANDLING**

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

### **2 PRODUCTS**

#### **2.01 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A 82/A 82M.
- .6 Welded steel wire fabric: to ASTM A 185/A 185M.
  - .1 Provide in flat sheets only.

- .7 Welded deformed steel wire fabric: to ASTM A 82/A 82M.
  - .1 Provide in flat sheets only.
- .8 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m<sup>2</sup>.
  - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
  - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
    - .1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
  - .3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
    - .1 In this case, no restriction applies to temperature of solution.
  - .4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
    - .1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .9 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

## **2.02 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain to Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

## **3 EXECUTION**

### **3.01 PREPARATION**

- .1 Galvanizing to include chromate treatment.
  - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

### **3.02 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by the Departmental Representative.

- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

### **3.03 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
  - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
  - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

### **3.04 FIELD TOUCH-UP**

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

### **3.05 CLEANING**

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

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

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

### **1.02 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 Cast-in-place concrete will not be measured but will be paid for as fixed price item.
  - .2 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.
  - .3 Measure supply and installation of waterstops in lineal metres installed.

### **1.03 REFERENCES**

- .1 Abbreviations and Acronyms:
  - .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
    - .1 Type GU or GUb - General use cement.
    - .2 Type MS or MSb - Moderate sulphate-resistant cement.
    - .3 Type MH or MHb - Moderate heat of hydration cement.
    - .4 Type HE or Heb - High early-strength cement.
    - .5 Type LH or LHb - Low heat of hydration cement.
    - .6 Type HS or HSb - High sulphate-resistant cement.
  - .2 Fly ash:
    - .1 Type F - with CaO content less than 8%.
    - .2 Type CI - with CaO content ranging from 8 to 20%.
    - .3 Type CH - with CaO greater than 20%.
  - .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards:
  - .1 ASTM International
    - .1 ASTM C 260-06, Standard Specification for Air-Entraining Admixtures for Concrete.
    - .2 ASTM C 309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    - .3 ASTM C 494/C 494M-08a, Standard Specification for Chemical Admixtures for Concrete.

- .4 ASTM C 1017/C 1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .5 ASTM D 412-06ae1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .6 ASTM D 624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .7 ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .8 ASTM D 1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
  - .2 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 CSA International
  - .1 CSA A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

#### 1.04 QUALITY ASSURANCE

- .1 Provide Departmental Representative, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .2 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
- .2 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 laboratory representative and concrete producer as described in CSA A23.1/A23.2.



- .2 Deviations to be submitted for review by the Departmental Representative.
- .3 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

## **2 PRODUCTS**

### **2.01 DESIGN CRITERIA**

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

### **2.02 PERFORMANCE CRITERIA**

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

### **2.03 MATERIALS**

- .1 Cement: to CSA A3001, Type GU or HS.
- .2 Water: to CSA A23.1.
- .3 Aggregates: to CSA A23.1/A23.2.
- .4 Admixtures:
  - .1 Air entraining admixture: to ASTM C 260.
  - .2 Chemical admixture: to ASTM C 494 Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

### **2.04 MIXES**

- .1 Performance Method for specifying concrete: to meet Departmental Representative's performance criteria to CSA A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

## **3 EXECUTION**

### **3.01 PREPARATION**

- .1 Obtain Laboratory representative written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.

- .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain laboratory representative approval of proposed method for protection of concrete during placing and curing.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

### 3.02 INSTALLATION/APPLICATION

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

- .2 Do not distort or pierce waterstop in way as to hamper performance.
- .3 Do not displace reinforcement when installing waterstops.
- .4 Use equipment to manufacturer's requirements to field splice waterstops.
- .5 Tie waterstops rigidly in place.
- .6 Use only straight heat sealed butt joints in field.
- .7 Use factory welded corners and intersections unless otherwise approved by Departmental Representative.

### **3.03 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.

### **3.04 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7 and 28 days.
  - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by the Departmental Representative for review to CSA A23.1/A23.2.
- .3 The Departmental Representative will pay for costs of tests.
- .4 Laboratory representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .6 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

**END OF SECTION**



**Part 1            General**

**1.1                REFERENCES**

- .1    ASTM International
  - .1    ASTM A 496/A 496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
- .2    CSA International
  - .1    CAN/CSA-A82-06, Fired Masonry Brick Made From Clay or Shale.
  - .2    CAN/CSA-A165 SERIES-04(R2009), CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
  - .3    CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.
  - .4    CAN/CSA-A370-04(R2009), Connectors for Masonry.
  - .5    CAN/CSA A371-04(R2009), Masonry Construction for Buildings.
  - .6    CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
  - .7    CSA S304.1-04(R2009), Design of Masonry Structures.
- .3    Green Seal Environmental Standards (GS)
  - .1    GS-11-2008, 2nd Edition, Paints and Coatings.

**1.2                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 masonry products and include product characteristics, performance criteria, physical size, finish and limitations in accordance with section 01 33 00 – Submittal Procedures.
  - .2    Submit copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
    - .1    Indicate VOC's in g/L for epoxy coatings and galvanized protective coatings and touch-up products to be applied within building envelope.
- .3    Shop Drawings:
  - .1    Shop drawings consist of bar bending details, lists and placing drawings.
  - .2    Placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .4    Samples:
  - .1    Submit 2 sample full size for review and acceptance of the architectural bloc.

### 1.3 CONDITION OF IMPLEMENTATION

- .1 Ambient conditions and environment.
  - .1 Implementation by cold weather.
    - .1 Respect the prescriptions below besides the requirements formulated in paragraphe 5.15.2 of the standard CSA-A371.
      - .1 Maintain the mortar in a temperature between 5 and 50 degree celsius, until the use or stabilization of the batch.
      - .2 Maintain the ambient temperature between 5 and 50 degree celsius and protect the work against the wind chill index.
  - .2 Implementation by hot weather
    - .1 Cover the work with a waterproof tarpaulin that does not stain the freshly renlized masonry works, so that they do not dry too quickly.
    - .2 As long as the masonry works are not finished or protected by flashings or any other permanante construction, keep dry by means of waterproof tarpaulin that does not stain that shall be extended beyond the summit and the sides of the works on a distance sufficient to protect against the rain pushed by the wind.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 According to instruction written by the manufacturer, protect against the damage caused by the humidity the materials installed or stored on site.

## Part 2 Products

### 2.1 MASONRY UNITS

- .1 Standard concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1).
  - .1 Classification: H / 15 / C / O.
  - .2 Size: modular.
  - .3 Special shapes: provide square units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.
- .2 Special fire resistant concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1) as modified below.
  - .1 Classification: [H/15/B/O] except as modified by fire resistance requirements specified below.
  - .2 Fire resistant characteristics: aggregate used in units and equivalent thickness of units to National Building Code of Canada, for fire-resistance ratings indicated.
  - .3 Size: modular.

- .4 Special shapes: provide square units for exposed corners. Provide purpose-made shapes for lintels and bond beams and provide additional shapes as indicated.

## **2.2 REINFORCEMENT AND CONNECTORS**

- .1 Bar reinforcement: to CAN/CSA-A371 and CSA G30.18, Grade 400.
- .2 Continuous armatures of ladder type, constituted with 5 mm longitudinal wire spaced at 25 mm, inferior than the width of the wall and transverse wire in thread of 5 mm, welded at 400 mm.
- .3 Connectors and anchorings: compliant to the standards CSA-A370 et CSA-S304.
- .4 Protection against corrosion: according to standards CSA-S304 et CSA-A370.
- .5 Anchoring in the existing partition : of appropriate type, protected against corrosion.
- .6 Anchoring of partition in masonry in a transversal partition.
  - .1 Masonry: wire netting, of width suited, for block and of 200 mm of length.
- .7 Seismic connectors masonry facings adapted for a thickness of the insulating material according to the indications to drawings constituted:
  - .1 A galvanized steel T anchoring plate of 2,7mm gauge with two openings for anchoring screw.
  - .2 A galvanized steel L ankle of 3,1mm gauge with incorporated notches to receive a core wire
  - .3 Continuous galvanized core wire, 5mm gauge in 3000mm length

## **2.3 MORTAR AND GROUT**

- .1 Mortar: in accordances with standard CAN/CSA-A179.
  - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
  - .2 Colour: ground coloured natural aggregates or metallic oxide pigments, in accordance with standard ASTM-C979.
- .2 Mortar for interior concrete masonry block: mortar type S, according to the specifications relative to the properties of ACNOR A179 for pre-mixed type in factory, color standard grey
- .3 Mortar for exterior concrete masonry block above level ground: mortar type S, according to the specifications relative to the properties of ACNOR A179, color standard grey
- .4 Fine graine grout: type S, in accordance with paragraphe 7.23 of the ACNOR A179 standard, pre-mixed in factory type.

- .5 Water: in accordance with the requirements of CSA A179 standard, clean and without ice, oil, acids, alkalis, organic matters, sediments or any other harmful materials.
- .6 Resurfacing mortar for concrete block type suited for the application and pre-mixed in factory

## **2.4 ACCESSORIES**

- .1 Weep hole vents: purpose-made PVC, colour same as the architectural concrete block
- .2 Bolts: 12 mm diameter x 150 mm long with ends bent 50 mm at 90 degrees.
- .3 Nailing triangle: of at least 0,5mm in thickness, galvanized metal

## **Part 3 Execution**

### **3.1 GENERAL POINTS**

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
  - .1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below.
  - .2 Coursing height: 200 mm for one block and one joint.
  - .3 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .2 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

### **3.2 CONSTRUCTION**

- .1 Exposed masonry:
  - .1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
  - .2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
- .2 Building-in:
  - .1 Install masonry connectors and reinforcement where indicated on drawings.
  - .2 Build in items required to be built into masonry.
  - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  - .4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
  - .5 Install loose steel lintels over openings where indicated.



- .3 Concrete block lintels:
  - .1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
  - .2 End bearing: not less than 200 mm as indicated on drawings.
- .4 Provision for movement:
  - .1 Leave 5 mm space below shelf angles.
  - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
  - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .5 Interface with other work:
  - .1 Cut openings in existing work as indicated.
  - .2 Openings in walls: approved by the architect.
  - .3 Make good existing work. Use materials to match existing.
- .6 Build in flashings in masonry in accordance with CAN/CSA-A371.
  - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
  - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
    - .1 For masonry backing embed flashing 25 mm in joint.
    - .2 For concrete backing, insert flashing into reglets.
    - .3 For wood frame backing, staple flashing to walls behind sheathing paper.
    - .4 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.
  - .3 Lap joints 150 mm and seal with adhesive.
- .7 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

### **3.3 REINFORCING AND CONNECTING**

- .1 Install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371 and CSA S304.1 unless indicated otherwise.
- .2 Prior to placing concrete, mortar, grout, obtain Architects and Consultant's approval of placement of reinforcement and connectors.

### **3.4 BONDING AND TYING**

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

- .2 Tie masonry veneer to backing in accordance with NBC, CAN/CSA-A371, CSA S304.1 and as indicated.

### **3.5 REINFORCED LINTELS AND BOND BEAMS**

- .1 Reinforce masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CAN/CSA-A179, CAN/CSA-A371 and CSA S304.1.

### **3.6 GROUTING**

- .1 Grout masonry in accordance with CAN/CSA-A179, CAN/CSA-A371 and CSA S304.1 and as indicated.

### **3.7 ANCHORS**

- .1 Supply and install metal anchors as indicated.

### **3.8 LATERAL SUPPORT AND ANCHORAGE**

- .1 Supply and install lateral support and anchorage in accordance with CSA S304.1 and as indicated.

### **3.9 SITE TOLERANCES**

- .1 Tolerances indicated in the notes of article 5.3 of CAN/CSA-A371 standard are applied.

### **3.10 CLEANING**

- .1 Once the masonry work is done, proceed in cleaning the construction site to eliminate dirt and accumulated fragments, attributable to the building work and environment.
- .2 Once the work is done, evacuate the construction debris, the over stock material, the tools and the security fence

### **3.11 PROTECTION OF THE WORK**

- .1 Protect the masonry work against marks, the mortars dripping and other damage. Use protective tarpaulin that do not stain.

### **3.12 PROTECTION**

- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .2 Repair damage to adjacent materials caused by masonry products installation.

**END OF SECTION**

## 1 GENERAL

### 1.01 REFERENCES

- .1 ASTM International Inc.
  - .1 ASTM A 36/A 36M-08, Standard Specification for Carbon Structural Steel.
  - .2 ASTM A 193/A 193M-08, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.
  - .3 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .4 ASTM A 325-07a, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - .5 ASTM A 325M-08, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
  - .6 ASTM A 490M-04ae, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
  - .1 Handbook of the Canadian Institute of Steel Construction.
  - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CAN/CSA-S16-01(R2007), Limit States Design of Steel Structures.
  - .4 CAN/CSA-S136-07, North American Specifications for the Design of Cold Formed Steel Structural Members.
  - .5 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
  - .6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7 CSA W55.3-1965(R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
  - .1 MPI-INT 5.1-08, Structural Steel and Metal Fabrications.
  - .2 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
  - .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

## **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Shop Drawings:
  - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .2 Erection drawings:
  - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
    - .1 Description of methods.
    - .2 Sequence of erection.
    - .3 Type of equipment used in erection.
    - .4 Temporary bracings.
- .3 Fabrication drawings:
  - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Quebec, Canada.

## **1.03 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

## **2 PRODUCTS**

### **2.01 DESIGN REQUIREMENTS**

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 to resist forces, moments, shears and allow for movements indicated.

- .2 Shear connections:
  - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
  - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.

## **2.02 MATERIALS**

- .1 Structural steel: to CSA-G40.20/G40.21 Grade as indicated on general notes.
- .2 Anchor bolts: to CSA-G40.20/G40.21
- .3 Bolts, nuts and washers: to ASTM A 325M.
- .4 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.
- .5 Shop paint primer: see general notes.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.

## **2.03 FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA-S16.

## **2.04 SHOP PAINTING**

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with general notes.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
- .3 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .4 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

### **3 EXECUTION**

#### **3.01 APPLICATION**

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

#### **3.02 GENERAL**

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

#### **3.03 CONNECTION TO EXISTING WORK**

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

#### **3.04 MARKING**

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

#### **3.05 ERECTION**

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with approved erection drawings.
- .2 Field cutting or altering structural members: to approval of the Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

### **3.06 FIELD PAINTING**

- .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

**END OF SECTION**





**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 04 04 99 – Masonry for minor works.
- .3      Section 09 91 99 – Painting for minor works.

**1.2            REFERENCES**

- .1      ASTM International
  - .1      ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2      ASTM A 269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3      ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2      CSA International
  - .1      CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2      CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3      CSA S16-09, Design of Steel Structures.
  - .4      CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5      CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) [Metric].
- .3      Environmental Choice Program
  - .1      CCD-047-98(R2005), Architectural Surface Coatings.
  - .2      CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
- .4      Green Seal Environmental Standards (GS)
  - .1      GS-11-2008, 2nd Edition, Paints and Coatings.
- .5      Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1      Material Safety Data Sheets (MSDS).
- .6      The Master Painters Institute (MPI)
  - .1      Architectural Painting Specification Manual - current edition.

### **1.3 WELDING COMPANIES CERTIFICATION**

- .1 Welding companies must be certified by virtue of the article 2.1 of the standard of CSA W47.1 in the case of Welding by fusion or standard CSA W55.3 in the case of Welding by resistance. Submit the proof of certifications of the welding companies.

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

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data :
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing, bolts and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 33 00 – Submittal procedures.
    - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
- .4 The submitted shop drawing have to carry the seal of a competent engineer recognized in the province of Quebec.

### **1.5 QUALITY ASSURANCE**

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

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 Replace defective or damaged materials with new.
- .3 The visible surfaces of the stainless steel elements must be covered with a self-adhesive building paper or with a pelable plastic film before the shipping on the construction site of the element in question.
- .4 The surfaces must be cleared of their protective cover only at the time of the final cleaning of the building. Supply the necessary for the removal of these protections.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.
- .2 Welded steel wire treillis : to CSA G30.5.
- .3 Steel pipe: to ASTM A 53/A 53M galvanized finish, type E, grade A, seamless.
- .4 Welding materials: to CSA W59.
- .5 Welding electrodes: to CSA W48 Series.
- .6 Bolts and anchor bolts: to ASTM A 307.
- .7 Stainless steel : to ASTM A 269, Type commercial grade seamless welded with AISI No. 4 finish.
- .8 Stainless steel tubing: compliant to standard ASTM A240/A240M.
- .9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.
- .10 Galvanized steel anti-skid ladder rung, prefabricated for ladder.
- .11 Pieces to be inserted into the concrete: holds or thread stalks, in galvanized ferrous metal, or in ductile iron or steel cast iron. Supply bolts, slices, holds such as required, galvanization by hot dipping.
- .12 Attaches : galvanisées pour les ouvrages extérieurs et pour ceux devant être intégrés dans des murs extérieurs, de type, catégorie et classe selon les besoins.

### **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.

- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

## **2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.
- .2 Primer applied in workshop in compliance with the standard CAN/CGSB-1.40.
- .3 Zinc primer: ready to apply, in compliance with the standard CAN/CGSB-1.181.

## **2.4 ISOLATION COATING**

- .1 Isolate aluminum from following components, by means of bituminous paint:
  - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
  - .2 Concrete, mortar and masonry.
  - .3 Wood.

## **2.5 SHOP PAINTING**

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

## **2.6 ANGLE LINTELS**

- .1 Steel angles: galvanized, sizes indicated for openings. Provide 200 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.

## **2.7 FIRERATED ACCESS TRAP DOOR**

- .1 Fire rated non-insulated access trap door, rating 1½ hours. Access/Door in accordance with NFPA 252-2003, UL 10b, UL-555, CAN/ULC S112 M90-R2001, CAN/ULC S104-10.
  - .1 Door material: 16-gauge cold rolled sheet steel with 1 inch return fold around perimeters
  - .2 Frame material: 16-gauge cold rolled sheet steel of 2-1/2 inch depth with 1/4 inch mounting holes and masonry anchors.
  - .3 Size: 36 inch W x 36 inch H.
  - .4 Hinges: Flush continuous piano type.

- .5 Latching/Locking Devices: Standard, ring key/tool key operated latch bolts
- .6 Automatic Closure Devices: Spring operated automatic closures device for each door
- .7 Materials, Finishes: Steel Finish, Grey Color: Standard, phosphate dipped steel

### **Part 3 Execution**

#### **3.1 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to a competent engineer recognized in the province of Quebec, such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16 or Weld field connection.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.

#### **3.2 FIRERATED ACCESS TRAP DOOR**

- .1 Verify that rough openings for door and frame are correctly sized and located.
- .2 Install access door and frame units in accordance with manufacturer's instructions at locations indicated on the Drawings including the following.
- .3 Install frames plumb, level, square, rigid without warp or rack in opening. Cut the concrete block to clear the lock protector box

- .4 Assurer the continuity of the firebreak and smoke stopper systems which are a part of the construction of the fire rated partition.

### **3.3 CLEANING**

- .1 Clean the metallic works after their implementation to free them of some dust generated by the building work or in the middle surrounding.
- .2 Once the implementation is finished, evacuate off the construction site the materials of overstock, waste, tools and barriers serving to protect the equipment.

**END OF SECTION**

**Part 1            General**

**1.1            REFERENCES**

- .1    CSA International
  - .1    CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
  - .2    CSA O121-08, Douglas Fir Plywood.
  - .3    CAN/CSA-O141-05, Softwood Lumber.
  - .4    CSA O151-09, Canadian Softwood Plywood.
  - .5    CAN/CSA-O325.0-07, Construction Sheathing.
- .2    Forest Stewardship Council (FSC)
  - .1    FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
  - .2    FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.
  - .3    FSC Accredited Certified Bodies.
- .3    Green Seal Environmental Standards (GS)
  - .1    GS-11-2008, 2nd Edition, Paints and Coatings.
- .4    National Lumber Grades Authority (NLGA)
  - .1    Standard Grading Rules for Canadian Lumber 2000.
- .5    South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1    SCAQMD Rule 1113-A2007, Architectural Coatings.

**1.2            QUALITY ASSURANCE**

- .1    Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2    Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3    Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

## **Part 2        Products**

### **2.1        LUMBER**

- .1    Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
  - .1    CAN/CSA-O141.
  - .2    NLGA Standard Grading Rules for Canadian Lumber.
  - .3    FSC certified.
- .2    Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
  - .1    S2S is acceptable.
  - .2    Board sizes: "Standard" or better grade.
  - .3    Dimension sizes: "Standard" light framing or better grade.
  - .4    Post and timbers sizes: "Standard" or better grade.

### **2.2        PANNEAUX**

- .1    Douglas fir plywood (DFP): to CSA O121, standard construction.
  - .1    Urea-formaldehyde free.
- .2    Canadian softwood plywood (CSP): to CSA O151, standard construction.
  - .1    Urea-formaldehyde free.
- .3    Plywood, OSB and wood based composite panels: to CAN/CSA-O325.
  - .1    Urea-formaldehyde free.

### **2.3        ACCESSORIES**

- .1    Nails, spikes and staples: to CSA B111.
- .2    Bolts: 12,5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .3    Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

### **2.4        FINIS**

- .1    Galvanised metal: galvanised fixation device according to the standard G164 CAN/CSA for exterior works.



**Part 3            Execution**

**3.1                INSTALLATION**

- .1        Comply with requirements of NBC, supplemented by the following paragraphs.
- .2        Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3        Align and plumb faces of furring and blocking to tolerance of 1:600.
- .4        Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5        Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .6        Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.
- .7        Install sleepers as indicated.
- .8        Use caution when working with particle board. Use dust collectors and high quality respirator masks.
- .9        Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .10       Countersink bolts where necessary to provide clearance for other work.

**3.2                ASSEMBLING**

- .1        Assemble, anchor, fix, stick and brace elements so as to insure them the necessary solidity and the rigidity.
- .2        If necessary, mill holes in a way that the heads of bolt do not overhang..

**END OF SECTION**



**Part 1        General**

**1.1        SUMMARY**

- .1    Section Includes:
  - .1        Material and installation for prefabricated wood trusses.
- .2    Related Requirements
  - .1        Section 01 33 00 – Submittal procedures.
  - .2        Section 06 08 99 – Rough carpentry for minor works.

**1.2        REFERENCES**

- .1    Canadian Standards Association (CSA International)
  - .1        CSA O80 Series-97(R2002), Wood Preservation.
  - .2        CAN/CSA-O86-01, Engineering Design in Wood.
  - .3        CAN/CSA-O141-91(R1999), Softwood Lumber.
  - .4        CSA S307-M1980(R2001), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
  - .5        CSA S347-99(R2004), Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
  - .6        CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
- .2    Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1        Material Safety Data Sheets (MSDS).
- .3    National Lumber Grades Authority (NLGA)
  - .1        NLGA-03, Standard Grading Rules for Canadian Lumber.
- .4    National Research Council (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
  - .1        CCMC-2002, Registry of Product Evaluations.
- .5    Truss Plate Institute of Canada (TPIC)
  - .1        TPIC - 1996 (R2001), Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

**1.3        DESIGN REQUIREMENTS**

- .1    Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CAN/CSA-O86.

- .2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.
- .3 Design trusses, bracing, bridging in accordance with CAN/CSA-O86.1 for loads indicated for building locality as ascertained by NBC, Climatic Information for Building Design in Canada and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.
- .4 Limit live load deflection to 1/360th of span where gypsum board ceilings are hung directly from trusses.

#### **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.
  - .2 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.
- .2 Pre-Installation Meeting:
  - .1 Convene pre-installation meeting one week prior to beginning work of this Section.
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building subtrades.
    - .4 Review manufacturer's installation instructions and warranty requirements.

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

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit two copies of Workplace Hazardous Materials Information System WHMIS MSDS. Indicate VOCs during application.
- .3 Shop Drawings:
  - .4 Each shop drawing submission to be signed and stamped by professional engineer registered or licensed in province of Quebec, Canada.
  - .5 Indicate special structural application and specification as according to local authorities having jurisdiction.

- .6 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates
- .7 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.
- .8 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.
- .9 Indicate arrangement of webs or other members to accommodate ducts and other specialties.
- .10 Show location of lateral bracing for compression members.
- .11 Instructions: submit manufacturer's installation instructions.

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

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Storage and Protection:
  - .1 Store trusses on job site in accordance with manufacturer's instructions. Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Lumber: spruce species, softwood, S4S, with maximum moisture content of 19% at time of fabrication and to following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.
- .2 Fastenings: to CAN/CSA-O86.

### **2.2 FABRICATION**

- .1 Fabricate wood trusses in accordance with reviewed shop drawings.
- .2 Provide for design camber and roof slopes when positioning truss members.
- .3 Connect members using metal connector plates.

- .4 Plan a maximal weight of 40lb/pi<sup>2</sup> for the weight of the supports and the electrical ducts anchored on the prefabricated wood trust. Indicate de reinforcements and the structure on the workshop drawings for approval.

## **2.3 SOURCE QUALITY CONTROL**

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

## **Part 3 Execution**

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

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

### **3.2 ERECTION**

- .1 Erect wood trusses in accordance with the manufacturer.
- .2 Handling, installation, erection, bracing and lifting in accordance with manufacturers instructions.
- .3 Make adequate provisions for handling and erection stresses.
- .4 Exercise care to prevent out-of-plane bending of trusses.
- .5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.
- .6 Install permanent bracing in accordance with reviewed shop drawings, prior to application of loads to trusses.
- .7 Do not cut or remove any truss material without approval of the manufacturer engineer.
- .8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

### **3.3 CLEANING**

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment on completion of installation.

**END OF SECTION**

**Part 1            General**

**1.1            CONTANT OF THE SECTION**

- .1        Application of the water repellents on exterior surfaces.

**1.2            RELATED REQUIREMENTS**

- .1        Section 01 33 00 – Submittal procedures.
- .2        Section 01 74 21 – Construction/demolition waste management and disposal.
- .3        Section 01 61 00 – Product requirements

**1.3            REFERENCES**

- .1        CAN/CGSB-37.2: Membrane, Elastomeric, Cold Applied Liquid.
- .2        CAN/CGSB-37.9M: Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing.
- .3        CGSB-37-GP-56M: Membrane, Bituminous, Prefabricated and Reinforced for Roofing.

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Prior to commencing the Work, submit copies of manufacturers current certification to ISO 9000. Membrane, primers, sealants, adhesives and associated auxiliary materials shall be included.
- .2        Prior to commencing the Work, submit references clearly indicating that the materials proposed have been installed for not less than fifteen years on projects of similar scope and nature. Submit references for a minimum of ten projects. Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .3        Prior to commencing the Work submit manufacturers complete set of standard details for waterproofing systems. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

**1.5            QUALITY ASSURANCE**

- .1        Perform Work in accordance with the printed requirements of the membrane manufacturer and this specification. Advise designer of any discrepancies prior to commencement of the Work.
- .2        Maintain one copy of manufacturers literature on site throughout the execution of the Work.
- .3        At the beginning of the Work and at all times during the execution of the Work, allow access to site by the waterproofing membrane manufacturers representative.

- .4 Materials used in this Section, including, primers, mastics and membranes, asphaltic protection boards, composite drainage boards and expansion joint membranes shall be fully compatible and shall be sourced and or produced by one manufacturer.
- .5 Submit copies of the membrane manufacturers current ISO certification including the manufacturing of the membrane, primer, mastics, adhesives and asphaltic protection board.

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

- .1 Deliver, handle, store and protect materials of this section in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Protect products from freezing.

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

- .1 Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
- .2 Cold applied elastomeric membrane should be stored in closed containers outdoors.
- .3 Store membrane at temperature of 5 degrees C (40 degrees F) and above to facilitate handling. Separate for reuse and recycling and place in designated containers Steel waste in accordance with Waste Management Plan.
- .4 Membrane contain petroleum solvents and are flammable. Do not use near open flame.
- .5 Store role materials horizontally in original packaging.
- .6 Store adhesives and primers at temperatures of 5 degrees C and above to facilitate handling.
- .7 Keep solvents away from open flame or excessive heat.

#### **1.8 SITE CONDITIONS**

- .1 Ensure continuity of the waterproofing membrane throughout the scope of this section.
- .2 Work shall be so scheduled as to provide a watertight seal at the end of each working day on the areas worked upon during the day.
- .3 No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.
- .4 Provide adequate protection of materials and work of this section from damage by weather backfilling operations and other causes.
- .5 Protect work of other trades from damage resulting from work of this section. Make good such damage at own expense to satisfaction of the consultant.
- .6 Apply protection board as soon as possible after installation of membrane.



## Part 2 Products

### 2.1 MATERIALS

- .1 Components and materials must be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.
- .2 Primary cold applied elastomeric asphalt emulsion waterproofing membrane in compliance with CGSB 37.2 shall be Aqua-Bloc® 720-38 Elastomeric Asphalt Emulsion Waterproofing Membrane manufactured by Bakor, a one component waterproofing compound compatible with sheet waterproofing membranes and substrates, having the following characteristics:
  - .1 Elongation: 2000%,
  - .2 Maximum VOC: 10 g/l
  - .3 Water vapour permeance: 10 ng/Pa.m<sup>2</sup>.s, ASTM E96,
  - .4 Chemical resistance: Alkalis, calcium chloride, mild acid and salt solutions.
- .3 Fabric reinforcement, a glass reinforcement sheet capable of allowing the membrane to bleed through adequately to provide a monolithic reinforced membrane system.
- .4 Flashing & transition membrane, 1.5mm (60 mils) SBS modified bitumen, self-adhering sheet membrane with a cross-laminated polyethylene film, Primer and fillet bead of Polymer Modified Sealing Compound.
- .5 Polypropylene Protection Board extruded flexible twin-wall protection board, with the following properties:

Thickness: 2mm  
Weight: 0.45 kg/m<sup>2</sup>  
3Compressive Strength: 0.45 kg/cm<sup>2</sup>

## Part 3 Execution

### 3.1 CONDITION OF SURFACES

- .1 Before commencing work, ensure environmental and site conditions are suitable for installation of waterproofing membrane.
- .2 The substrate shall be clean and dry, free from surface water, ice, snow or frost, dust, dirt, oil, grease, curing compounds or any other foreign matter detrimental to the adhesion of the waterproofing membrane.
- .3 Can be applied to damp or new green concrete. Ensure concrete is smooth and free from voids and honeycombing prior to application of waterproofing membrane.
- .4 Voids, cracks, holes and other damages to horizontal or vertical surfaces shall be repaired before application of the membrane. Secure cleats with two fasteners each and cover with cleat tabs.

### **3.2 DECK TO VERTICAL; JUNCTURES, FOOTING/FOUNDATION WALLS, CRACK IN SLB AND PROTRUSIONS**

- .1 Coat penetrations, such as brackets, clips, braces, etc. that are set into the concrete with a 2.3 mm (90 mil) coating of primary waterproofing membrane to the height of the wearing course and around projections to ensure a complete seal prior to coating the entire area.
- .2 Penetrations subject to movement should be flashed with fabric reinforcement set into a minimum thickness of 2.3 mm (90 mil) of primary waterproofing membrane to required height on the wall and at least 100 mm (4") on the slab, embed fabric reinforcement into wet coating followed by second coat.
- .3 To all cracks and cold joints less than 3 mm (1/8") apply a coat of primary waterproofing membrane at a minimum thickness of 2.3 mm (90 mil) and reinforce with fabric reinforcement.
- .4 To all cracks greater than 3 mm (1/8"), prime area and install self-adhered flashing membrane. Overlap end joint of sheet a minimum 75 mm (3").
- .5 At monolithic wall/slab junctures, apply primary waterproofing membrane at a minimum thickness of 2.3 mm (90 mil) to required height on the wall and at least 100 mm (4") on the slab and embed fabric reinforcement into wet primary waterproofing membrane followed by a second coat.
- .6 At non-monolithic wall/slab junctures, prime area, trowel-in fillet bead to inside corners and install self-adhered flashing membrane sheet to the required height on the wall and at least 100 mm (4") on the slab. Lap primary waterproofing membrane over a minimum of 50 mm (2").
- .7 At footing to foundation wall junctions apply a coat of primary waterproofing membrane at a minimum thickness of 2.3 mm (90 mil) and reinforce with fabric reinforcement followed by second coat.

### **3.3 PRIMARY WATERPROOFING MEMBRANE APPLICATION**

- .1 Single Coat Application (Vertical Applications)
  - .1 Apply a full and continuous coat of primary waterproofing membrane with a trowel, long handled squeegee, roofing brush or spray. Apply membrane at a rate of 2.0 l/m<sup>2</sup> (5 gal. U.S./100ft.<sup>2</sup>) to provide a minimum wet thickness of 2.3 mm (90 mils) ensuring no pinholes or blisters. Allow membrane to fully cure/dry prior to subsequent application coatings.
- .2 Heavy Duty Application (Vertical and Horizontal Applications)
  - .1 Apply a full and continuous coat of primary waterproofing membrane at approximately 1.5 l/m<sup>2</sup> (3.6 gal. US/100ft.<sup>2</sup>) and embed fabric reinforcement into coating ensuring no fishmouths or wrinkles are created and allow to set. Allow membrane to fully cure/dry prior to subsequent application coatings.
  - .2 Apply second full and continuous coat of primary waterproofing membrane at 1.5 l/m<sup>2</sup> (3.6 gal./100ft.<sup>2</sup>) and allow to cure.

### **3.4 CLEAN UP**

- .1 Promptly as the work proceeds and on completion clean up and remove from site all rubbish and surplus materials resulting from the foregoing work.

**END OF SECTION**



**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 01 61 00 – Common product requirements
- .3      Section 03 30 00 – Cast-in-place concrete, see structured engineer.
- .4      07 24 10-03 – Exterior finish – Direct applied

**1.2            REFERENCES**

- .1      American Society for Testing and Materials International (ASTM)
  - .1      ASTM C 208-95(2001), Specification for Cellulosic Fiber Insulating Board.
  - .2      ASTM C 591-01, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
  - .3      ASTM C 612-04, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
  - .4      ASTM C 726-05, Standard Specification for Mineral Fiber Roof Insulation Board.
  - .5      ASTM C 728-05, Standard Specification for Perlite Thermal Insulation Board.
  - .6      ASTM C 1126-04, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
  - .7      ASTM C 1289-05a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  - .8      ASTM E 96/E 96M-05, Standard Test Methods for Water Vapour Transmission of Materials.
- .2      Canadian Gas Association (CGA)
  - .1      CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.
  - .2      CAN/CGA-B149.2-05, Propane Storage and Handling Code.
- .3      Canadian General Standards Board (CGSB)
  - .1      CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .4      Underwriters Laboratories of Canada (ULC)
  - .1      CAN/ULC-S604-M91, Standard for Type A Chimneys.

- .2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
- .3 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
- .4 CAN/ULC-S704-03, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's insulation products and adhesives.
- .2 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions.

### 1.4 QUALITY ASSURANCE

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

## Part 2 Products

### 2.1 INSULATION

- .1 Extruded polystyrene (XPS) without CFC, with skin integrated at high density; compliant to the standard CAN/ULC-S701.
  - .1 Type: 4.
  - .2 Compressive strength: 210 kPa.
  - .3 Thickness: as indicated.
  - .4 Size: 1220 mm x 2440 mm.
  - .5 Edges: rabbet with draining grooves.

- .2 Extruded polystyrene (XPS) without CFC, with skin integrated at high density: compliant to the standard CAN/ULC-S701. For use in Fondation wall insertion.
  - .1 Type: 4.
  - .2 Compressive strength: 415 kPa.
  - .3 Thickness: as indicated.
  - .4 Size: 1220 mm x 2440 mm.
  - .5 Edges: square.

## **2.2 ADHESIVE**

- .1 Adhesive (for polystyrene insulation): in compliance with the standard CGSB 71-GP-24.
  - .1 According to the manufacturer's recommendations.

## **2.3 ACCESSORIES**

- .1 Insulation clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.

## **2.4 FONDATION FINISH**

- .1 Exterior foundation finish applied on the surface of the board insulation, as indicated on the drawings. Install according to section 07 24 10.03 - Exterior finish – Direct applied

## **Part 3 Execution**

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

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

### **3.2 WORKMANSHIP**

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2, type B and L vents.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Do not enclose insulation until it has been inspected and approved by Consultant.

### **3.3 EXAMINATION**

- .1 Examine substrates and immediately inform Consultant in writing of defects.
- .2 Prior to commencement of work ensure:
  - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

### **3.4 RIGID INSULATION INSTALLATION**

- .1 Apply adhesive to polystyrene by notched trowel in accordance with manufacturer's recommendations.
- .2 Imbed insulation boards into vapour barrier type adhesive, applied as specified, prior to skinning of adhesive.

### **3.5 PERIMETER FOUNDATION INSULATION**

- .1 Exterior application: extend boards 1220 mm minimum below finish grade as indicated. Install on exterior face of perimeter foundation wall with adhesive.
- .2 Under slab application: extend boards 610 mm in from perimeter foundation wall as indicated. Lay boards on level compacted fill.

### **3.6 CLEANING**

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

**END OF SECTION**



**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 01 61 00 – Common product requirements.
- .3      Section 06 08 99 – Rough carpentry for minor works.
- .4      Section 06 17 53 – Shop – Fabricated wood trusses.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials International (ASTM)
  - .1      ASTM C 553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .2      ASTM C 665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - .3      ASTM C 1320-05, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2      Canadian Gas Association (CGA)
  - .1      CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.
  - .2      CAN/CGA-B149.2-05, Propane Storage and Handling Code.
- .3      Canadian Standards Association (CSA International)
  - .1      CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .4      Underwriters Laboratories of Canada (ULC)
  - .1      CAN/ULC-S604-M1991, Type A Chimneys.
  - .2      CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Product Data:
  - .1      Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Manufacturer's Instructions:
  - .1      Submit manufacturer's installation instructions.

## **1.4 QUALITY ASSURANCE**

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **Part 2 Products**

### **2.1 SUSTAINABLE REQUIREMENTS**

- .1 Thermal insulator made with roukribre, batt type insulation to use in the outer wall and roof space: compliant to the standard CAN/ULC S702.
  - .1 Type 1
  - .2 RSI in compliance with the teste performed by the manufacturer and with the requirements of the standard ASTM C518.
    - .1 0,74/25 mm in thickness, required valve indicated to drawings.
  - .3 Characteristics of superficial combustibility corresponding to the standard CAN/ULC-S102.28
    - .1 Flame spread rating: 0.
    - .2 Smoke release rating: 0.
  - .4 Slow combustion resistance compliante to standard ULC S-102.
  - .5 Classified incombustible according to the standard CAN-S114.
  - .6 Dimensions: as indicated.

### **2.2 ACCESSORIES**

- .1 Insulation clips:
  - .1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .2 Tape: as recommended by manufacturer.

**Part 3            Execution**

**3.1                MANUFACTURER'S INSTRUCTIONS**

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

**3.2                INSULATION INSTALLATION**

- .1        Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C 1320.
- .2        Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3        Do not compress insulation to fit into spaces.
- .4        Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 Type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B and L vents.
- .5        Do not enclose insulation until it has been inspected and approved by Consultant.

**3.3                CLEANING**

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

**END OF SECTION**



**Part 1            General**

**1.1               RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 01 61 00 – Common product requirements.
- .3      Section 04 04 99 – Masonry for minor works.
- .4      Section 07 21 13 – Board insulation.

**1.2               REFERENCES**

- .1      American Society for Testing and Materials International (ASTM).
  - .1      ASTM B 117-03, Standard Practice for Operating Salt Spray (Fog) Apparatus.
  - .2      ASTM C 67-05, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
  - .3      ASTM C 144-04, Standard Specification for Aggregate for Masonry Mortar.
  - .4      ASTM D 968-05, Standard Test Methods for Abrasion Resistance of Organic Coatings by the Falling Abrasive.
  - .5      ASTM D 2247-02, (U.S. Federal Test 141A 6201), Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
  - .6      ASTM E 72-05, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
  - .7      ASTM E 96/E 96M-05, Standard Test Methods for Water Vapor Transmission of Materials.
  - .8      ASTM E 695-03, Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.
  - .9      ASTM G 154-05, Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
- .2      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-1.162-2004, Emulsion Coating for Stucco and Masonry.
  - .2      CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3      Canadian Standards Association (CSA International)
  - .1      CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1      CSA-A3001-03, Cementitious Materials for Use in Concrete.

- .4 Health Canada (HC)
  - .1 Workplace Hazardous Materials Information System (WHMIS).
  - .2 Material Safety Data Sheets (MSDS).
- .5 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN-ULC-S101-04, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
  - .2 CAN-ULC-S102-03, Standard Methods for Surface Burning Characteristics of Building Materials and Assemblies.
  - .3 CAN-ULC-S134-92, Standard Method of Fire Test of Exterior Wall Assemblies.

### 1.3 DEFINITIONS

- .1 Aesthetic joint: joint for appearance or installation ease. Also known as reveals grooves and reglets used to provide starting and stopping points during application of finish coat.
- .2 Base coat adhesive: adhesive used in base coat. Polymer modified, polymer based or cementitious material, typically mixed with Portland cement.
- .3 Base coat: base coat consists of 2 components; base coat adhesive and reinforcing mesh.
- .4 Direct-Applied: direct-applied systems use EIFS-like coatings applied directly to rigid sheathing boards. Insulation is not used in these systems, thus, they are not EIFS.
- .5 Lamina: base coat reinforcing mesh and finish.
- .6 Reinforcing mesh: woven glass fibre reinforcement to base coat providing impact resistance.

### 1.4 SYSTEM DESCRIPTION

- .1 Performance requirements: ensure installed modified polymer (soft) coat wall system has following performance properties:
  - .1 Comply with CAN-ULC-S134.
  - .2 Finish abrasion resistance: falling sand method to ASTM D 968, no deleterious effects.
  - .3 Finish salt spray resistance: to ASTM B 117, after 300 hours exposure to 5 % salt spray solution - no effects.
  - .4 Finish moisture resistance: to ASTM D 2247 (U.S. Federal test 141 A6201), after 14 days exposure - no deleterious effects.
  - .5 Accelerated weathering: to CAN/CGSB-1.162, ASTM G 154, 2000 hours - no effect.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit product data.
  - .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS acceptable to Labour Canada, and Health and Welfare Canada for exterior finish - direct applied materials. Indicate VOC content.
  - .3 Submit product data sheets for system materials. Include product characteristics, performance criteria, limitations and colours.
- .3 Shop Drawings: submit shop drawings and indicate wall layout, details, connections, expansion joints, finish system, installation sequence, including interface with fascias, walls, air barriers, vapour retarders and other components.
- .4 Samples:
  - .1 Submit samples.
    - .1 Submit one 300 x 300 mm sample of each colour of finished soffit system prior to fabrication of mock-up.

## 1.6 QUALITY ASSURANCE

- .1 Quality Assurance:
  - .1 Installer: company or person specializing in application of exterior finish system (direct applied) with 5 years documented experience approved by manufacturer.
  - .2 Installation of exterior finish system by applicators certified by manufacturers of system used.
  - .3 Submit certification to Consultant prior to commencement of work.
- .2 Mock-ups:
  - .1 Construct mock up of complete exterior finish system on typical exterior soffit 300 mm long x 300 mm wide incorporating:
    - .1 Joints to demonstrate aesthetic, control and expansion joint construction.
    - .2 Construction at changes in substrate.
    - .3 Construction at corner stop.
    - .4 Construction at fascias.
    - .5 Construction at both large and small penetrations.
    - .6 Construction at surface mounted objects and foam shapes.
    - .7 Colour, texture and finish.
  - .2 Construct mock-up where directed.
  - .3 Allow 24 hours for inspection of mock-up by Consultant before proceeding with work.
  - .4 When accepted, mock-up will demonstrate minimum standard for work, and may remain as part of finished work.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in accordance with manufacturer's instructions.
- .3 Protect base finish materials from freezing.
- .4 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of insulation, adhesive and caulking materials.

## **1.8 AMBIENT CONDITIONS**

- .1 Temperature, relative humidity, moisture content.
  - .1 Apply exterior finish system components at temperatures, relative humidity, and substrate moisture content and substrate temperature in accordance with manufacturer's written instructions.
  - .2 Maintain ambient temperature above 4 degrees C during base coat application and until cured minimum 24 hours.
  - .3 Maintain ambient temperature above 4 degrees C during finish coat application and until cured minimum 24 hours.

## **1.9 WARRANTY**

- .1 Contractor warrants that exterior finish system will not leak or delaminate in accordance with General Conditions (GC) CCDC GC 12.3, but for 24 months.

## **Part 2 Products**

### **2.1 SURFACE PREPARATION**

- .1 Conditioner: water based or acrylic, clear conditioner/sealer compatible with system materials, recommended by system manufacturer.
- .2 Leveller: polymer-modified, cement-based, reinforced levelling compound.

### **2.2 BASECOAT**

- .1 Modified polymer: non-cementitious, fibre reinforced, premixed base coat system, colour and finish same as existing work.
- .2 Modified, cementitious base coat system: cement, silica sand aggregate, acrylic liquid admixture, 13.2 % acrylic to cement ratio, texture and colour same as existing work.
- .3 Acrylic: non-cementitious, fibre reinforced base coat system, texture and colour same as existing work.



## **2.3 REINFORCING MESH**

- .1 Balanced, woven glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, compatible with chemical bonding system base coat and finish coat, weight standard – 163 g/m<sup>2</sup>.
- .2 Speciality mesh:
  - .1 Detail mesh: flexible, symmetrical, woven glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, compatible with chemical bonding system base coat and finish coat, weight 153 g/m<sup>2</sup>.
  - .2 Corner mesh: pre-creased, non-woven glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, compatible with chemical bonding system base coat and finish coat, weight 212 g/m<sup>2</sup>.

## **2.4 FINISH COAT**

- .1 Modified polymer finish coat system: acrylic resins in dispersion, silica aggregate, integral mineral pigmentation and additives, colour same as existing work.
- .2 Modified finish coat system: synthetic stucco, acrylic type, cement, silica sand aggregate, integral mineral pigmentation and additives, colour and finish same as existing work.

## **2.5 PRIMER**

- .1 Acrylic based and silicone enhanced primer.

## **2.6 ACCESSORIES**

- .1 Accessories: galvanized corner beads, casing beads, stop beads, and accessories, as recommended by exterior finish system manufacturer to suit system components.

## **2.7 EXPANSION JOINTS**

- .1 Expansion joints: acier galvanized.
- .2 Ensure expansion joints are back wrapped.
- .3 Joint Cleaner: non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .4 Sealant primer: as recommended by sealant manufacturer.
- .5 Joint filler: extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 - 200 kPa, oversized 30 to 50%.

- .6 Sealant: in accordance with Section 07 92 00 - Joint Sealing asbestos-free sealant, compatible with systems materials, recommended by system manufacturer.
  - .1 Weather seals: multi-component, chemical curing to CAN/CGSB-19.24, Type 2, Class B.
  - .2 Panel joints: multi-component, chemical curing to CAN/CGSB-19.24, Type 2, Class B.

## **2.8 MATERIALS: SITE MIX**

- .1 Cement: to CSA-A3001, Type GU.
- .2 Sand: dry bag.
  - .1 For white cement: silica sand, 30-50 mesh.
  - .2 For grey cement: mortar sand to ASTM C 144.
- .3 Water: potable.

## **2.9 MIXES**

- .1 General:
  - .1 Mixer: high speed, clean and rust free.
  - .2 Mixing pail: clean and rust free.
  - .3 Mixes: additive free.
- .2 Conditioner: mix in accordance with manufacturer's written instructions.
- .3 Leveller: mixed to uniform consistency in accordance with manufacturer's written instructions.
- .4 Basecoat: mixed to uniform consistency in accordance with manufacturer's written instructions.
- .5 Finish coat: mixed to uniform consistency in accordance with manufacturer's written instructions.

## **Part 3 Execution**

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

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

### **3.2 EXAMINATION**

- .1 Inspect and verify condition of existing substrate surfaces for contamination, surface absorption, chalkiness, cracks, damage, deterioration, moisture content, moisture damage, and tolerances.

- .1 Substrate tolerance not greater than 6 mm in 2500 mm design deflection no greater than 1/240 in accordance with manufacturer's written instructions.
- .2 Report deviations from specified requirements or other conditions that might adversely affect exterior finish system installation in writing to Consultant.
- .3 Proceed with Work only after receipt of written approval from Consultant.

### **3.3 PREPARATION**

- .1 Protection:
  - .1 Protect adjacent surfaces from damage resulting from Work of this section.
  - .2 Protect finished Work from water penetration at end of each day or on completion of each section of Work.
  - .3 Protect installation from moisture for 48 hours minimum after completion of each portion of Work.
- .2 Surface preparation:
  - .1 Ensure environmental and site conditions are suitable for installation of system.
  - .2 Prepare new and existing surfaces in accordance with manufacturer's written instructions.
  - .3 Conditioner: water based acrylic, clear conditioner/sealer compatible with system materials, substrate and as recommended by system manufacturer.
    - .1 Add water and mix.
    - .2 Apply to clean, dry substrate surfaces ensuring complete even coverage in accordance with manufacturer' written instructions.
  - .4 Leveller: polymer-modified, cement based, reinforced levelling compound.
    - .1 Add water and mix.
    - .2 Allow set time.
    - .3 Apply to existing substrate, 6 mm thick maximum.
    - .4 Allow time to fully cure.

### **3.4 INSTALLATION**

- .1 Install system in accordance with CAN-ULC-S134.
- .2 Accessories:
  - .1 Install required accessories as detailed and as required by exterior finish system manufacturer, and in accordance with CAN-ULC-S134.
- .3 Joints:
  - .1 Reveals and Aesthetic Grooves.
    - .1 Cut reveals and aesthetic grooves with appropriate tool in locations indicated in accordance with details.

- .2 Expansion joints:
  - .1 Install expansion joints in locations indicated and to manufacturers written instructions.
  - .2 Install expansion joints where new construction abuts existing construction and at locations where movement is expected to be greater than 6 mm.
- .4 Mesh and Base Coat Application:
  - .1 Apply 225 x 300 mm diagonal strips of detail mesh at corners, lights, grilles and penetrations through system.
    - .1 Embed strips in wet base coat and trowel from centre to mesh edge to avoid wrinkles.
  - .2 Apply detail mesh at reveals.
    - .1 Embed mesh in wet base coat and trowel from base of reveal to mesh edges.
  - .3 Apply corner mesh at inside and outside corners.
    - .1 Embed mesh in wet base coat and trowel from corner of mesh edges.
  - .4 High impact mesh application: apply base coat over substrate to uniform thickness of approximately 3 mm.
    - .1 Work horizontally or vertically in 1000 mm strips, and immediately embed mesh into wet base coat by troweling from centre to mesh edge.
    - .2 Butt mesh at seams.
    - .3 Mechanically fasten mesh.
    - .4 Allow basecoat to dry.
  - .5 Standard mesh application:
    - .1 Apply base coat over substrate, including areas with high impact mesh to uniform thickness of approximately 3 mm.
    - .2 Work horizontally or vertically in 1000 mm strips, and immediately embed mesh into wet base coat by troweling from centre to mesh edge.
      - .1 Mechanically fasten mesh.
    - .3 Overlap mesh 64 mm minimum at mesh seams and overlaps of detail mesh.
    - .4 Feather seams and edges.
    - .5 Double wrap inside and outside corners with minimum 64 mm overlap in each direction.
      - .1 Embed corner mat in wet base coat, allow to dry, then overlap up to corner with standard reinforcing mesh embedded in base coat.
    - .6 Avoid wrinkles in mesh.
    - .7 Fully embed mesh so that no mesh colour shows through basecoat when dry.

- .8 Ensure minimum base coat thickness of 1.6 mm when dry.
  - .1 Re-skim base coat if 1.6 mm thickness not achieved during initial application.
  - .2 Allow base coat to thoroughly dry before applying primer or finish coat.
- .5 Finish Coat Application
  - .1 Apply finish coat in accordance with manufacturer's written installation instructions.
  - .2 Prime dry base coat and allow to dry thoroughly before applying finish coat.
  - .3 Apply finish coat directly over base coat, or primed basecoat, only after base coat or primer has thoroughly dried.
  - .4 Apply finish by spray or trowel as recommended by manufacturer.
  - .5 Apply finish in continuous application, and work towards wet edge.
  - .6 Do not install separate batches of finish coat side by side.
  - .7 Do not apply finish into or over sealant joints.
    - .1 Apply finish to outside of wall only.
  - .8 Do not apply finish over irregular or unprepared surfaces.
  - .9 Apply textured or aggregate finishes to wall areas as indicated and in accordance with manufacturer's written instructions.

### **3.5 CLEAN UP**

- .1 Upon completion of installation remove excess materials, droppings and debris, tools and equipment barriers.
- .2 Clean surface and adjacent work area of foreign materials resulting from installation procedures.

**END OF SECTION**



**Part 1            General**

**1.1               RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 01 61 00 – Common product requirements.
- .3      Section 06 08 99 – Rough carpentry for minor works.
- .4      Section 07 21 16 – Blanket insulation.
- .5      Section 07 62 00 – Sheet metal flashing and trim.

**1.2               REFERENCES**

- .1      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
  - .2      CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
  - .3      ONGC 37-GP-56M-85, prefabricated reinforced bituminous membrane for roof sheeting.
  - .4      Part 5 of the national building code of Canada, separation of different part.

**1.3               ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4               QUALITY CONTROL**

- .1      Make sure that the consultant has inspected the vapor and air barrier before covering them with another material

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

- .1 Deliver materials in original packaging and store them in a dry place protected from bad weather, according to the section 01 61 00 - general Requirements concerning products.
- .2 Transport, store and handle materials and equipment according to the written instructions of the manufacturer.
- .3 Avoid unnecessary spillages, inform immediately the owner and proceed to the cleaning.
- .4 In case of spillage, clean the soiled surfaces and put them back to their original state.

## **1.6 IMPLEMENTATION CONDITIONS**

- .1 Respect the conditions of implementation prescribed by the manufacturer. Surfaces must be dry and above 0°C.
- .2 Concrete walls and joints of masonry must have aged of at least 7 days before its application.
- .3 Implement the waterproof products with polymerization by evaporation of the solvent and the adhesive materials releasing vapors in open space provided with ventilation.
- .4 Maintain the temperature and the degree of humidity at the levels recommended by the manufacturers of materials, before, during and after their implementation.

## **1.7 QUALITY ASSURANCE**

- .1 Qualification:
  - .1 Applicator: the implementation of materials must be made by a company specialized in the execution of the works planned in the present section, possessing at least 5 years of experience.
    - .1 The implementation of the vapor and air barrier systems must be approved by the manufacturer.
  - .2 Applicator: the implementation of materials must be made:
    - .1 By a company accredited by National Air Barrier Association or another certification body.
    - .2 which has to preserve its accreditation during all the duration of the works.



## **1.8 MANAGEMENT AND ELIMINATION OF WASTE**

- .1 Sort out waste with the aim of their recycling.

## **Part 2 Products**

### **2.1 SHEET VAPOUR BARRIER**

- .1 Polyethylene film: according to standard CAN/CGSB-51.34, 0.15 mm thick.

### **2.2 SHEET AIR BARRIER**

- .1 Air infiltration barrier sheet, made with a very fine fibers of high-density polyethylene (olefins fibers) of 0.15 mm ( 6.1mil ) thicknesses, in rolls of 2.75m of width.

### **2.3 SELF ADHESIVE MEMBRANE**

- .1 Vapor and air barrier connecting membrane composed of a compound of rubberized SBS asphalt laminated on a crossed polyethylene film, and having the following physical properties:
  - .1 Thickness: 1 mm.
  - .2 Temperature of application: +5°C, minimum (including consecutive 6 hours before the pose(installation)).
  - .3 Vapor permeance (ASTM E96): 1,6 ng / Pa.s.m2
  - .4 Air permeance to 75 Pa (ASTM E283-91): 0.003 L / s.m2.
- .2 Intramule flashing membrane composed of a compound of rubberized SBS asphalt laminated on a crossed polyethylene film, and having the following physical properties:
  - .1 Thickness: 1 mm.
  - .2 Temperature of application: -4°C, minimum
  - .3 Vapor permeance (ASTM E96): 1,6 ng / Pa.s.m2
  - .4 Air permeance to 75 Pa (ASTM E283-91): 0.003 L / s.m2.

### **2.4 PRIMER AND MASTIC**

- .1 Primer and putty for self-adhesive membrane on masonry, concrete, wood, panels of sub-cover and metallic surfaces, according to the recommendations of the manufacturer and according to the ambient temperature.

## **2.5 VARIA MATERIEL**

- .1 Sheet of galvanized steel, gauge 20, for base support for the flashing and expansion joints of the exterior masonry work, vertically and horizontally. Sheet of galvanized steel, gauge 16, in the perimeter of plywood frames for windows and curtains walls.
- .2 Joint sealing tape: air resistant pressure sensitive adhesive tape, cloth fabric duct tape type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .3 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer, in accordance with Section 07 92 00 - Joint Sealing.
- .4 Staples: minimum 6 mm leg.

## **Part 3 Execution**

### **3.1 INSTALLATION OF VAPOR AND AIR BARRIER**

- .1 Make sure that the utility pipes and the insulation have been put in place and inspected by the professionals before proceeding to the installation of the vapor.
- .2 Before installing the plasterboards, install the vapor barrier in sheets of the hot side of the outer walls and in the ceiling of roofs isolated by the inside, so as to form a continuous barrier.
- .3 To reduce to a minimum the number of joints, use sheets having the biggest possible dimensions.
- .4 Make sure that the sheets form a continuous barrier. Where necessary, repair the puncture and the tears with a sealing ribbon before hiding the work.

### **3.2 INSTALLATION OF THE SELF ADHESIVE VAPOR AND AIR BARRIER MEMBRANE**

- .1 Apply the primer to the rate of .25 L / m<sup>2</sup>. Let dry until obtaining a sticky surface. Prepare only the surfaces which can be covered during the day. Temperature of application preferably above 5°C.
- .2 Overlap the lateral joints of at least 65 mm and 150 mm in the extremity joints.
- .3 Press firmly the extremities and roll surfaces.
- .4 In the following places put a reinforcement strip of 300 mm in width:
  - .1 In the internal and outer corners.
  - .2 In the joints of beams.

- .3 In the joints of columns.
- .5 Cut and adjust the membrane around openings and seal joints with the mastic sealing compound

### **3.3 MASONRY FLASHING**

- .1 Install the flashing membrane in the masonry according to the following prescriptions:
  - .1 Install the flashing under the first masonry row of the outside wall, on the foundation walls, the concrete slab, the support angle, and the steel angle placed over openings. Install flashings under the masonry rows containing weep holes as well as other places according to the indications.
  - .2 In the masonry walls, install flashing in a way that they cross the outer wall starting from the external face of the wall, and to lift the internal part of at least 150 mm.

### **3.4 PRELEMINARY WORK FOR BASE SUPPORT**

- .1 Clear of any particle non-adhesive or foreign material, the surfaces to which the membranes will be applied.
- .2 Remove the asperities, the sharp edges, the oily marks, the grease and hardening composite, repair any defect of the surface which can damage the adhesion or the application.
- .3 Seal concrete surfaces containing big space or scaled zones and the open mortar joints as to form a uniform surface.

### **3.5 PRIMER**

- .1 Apply the primer to all the concrete, masonry and metal surfaces that will receive the air barrier membrane.
- .2 Apply by means of a roller with heavy padding surface, at the rate from 6 to 8 m<sup>2</sup>/l and let it dry for  $\pm 30$  min. before the application of the membrane.
- .3 Apply a new coat of primers to the surfaces which were not able to be covered with membrane on the same day.

### **3.6 EXTERIOR SURFACE OPENINGS**

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

### **3.7 PERIMETER SEALS**

- .1 Seal perimeter of sheet vapour barrier as follows:
  - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
  - .2 Lap sheet over sealant and press into sealant bead.
  - .3 Install staples through lapped sheets at sealant bead into wood substrate.
  - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

### **3.8 LAP JOINT SEALS**

- .1 Seal lap joints of sheet vapour barrier as follows:
  - .1 Attach first sheet to substrate.
  - .2 Apply continuous bead of sealant over solid backing at joint.
  - .3 Install staples through lapped sheets at sealant bead into wood substrate.
  - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

### **3.9 ELECTRICAL BOXES**

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
  - .1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
  - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

### **3.10 INSPECTION AND REPAIR**

- .1 Inspect carefully the continuity of the membrane before covering it and repair any damage and defective zone. Have the vapor and air barrier inspected and approved by the architect before covering them.

**END OF SECTION**

**Part 1            General**

**1.1            CONTENT OF THE SECTION**

- .1        Materials and roofing material in sheet or metallic, including mansard and installation of the roof.

**1.2            RELATED REQUIREMENTS**

- .1        Section 01 33 00 – Submittal procedures.
- .2        Section 01 61 00 – Common product requirements.
- .3        Section 06 17 53 – Shop – Fabricated wood trusses.
- .4        Section 07 92 00 – Joint sealants.

**1.3            REFERENCES**

- .1        Aluminum Association (AA).
  - .1        AA DAF-45-R03, Designation System for Aluminum Finishes - 9th Edition.
  - .2        AA ASM-35-October 2000, Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5.
- .2        American Society for Testing and Materials International, (ASTM).
  - .1        ASTM A 167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2        ASTM A 240/A 240M-02a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .3        ASTM A 653/A 653M-02a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .4        ASTM A 792/A 792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
  - .5        ASTM B 32-00e1, Standard Specification for Solder Metal.
  - .6        ASTM B 370-98, Standard Specification for Copper Sheet and Strip for Building Construction.
  - .7        ASTM D 523-89(1999), Standard Test Method for Specular Gloss.
  - .8        ASTM D 822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3        Canadian General Standards Board (CGSB).
  - .1        CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
  - .2        CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.

- .3 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .4 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .4 Canadian Standards Association (CSA International).
  - .1 CAN/CSA A123.3-98, Asphalt Saturated Organic Roofing Felt.
- .5 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act (CEPA), 1999.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .7 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC).
  - .1 CCMC-2002, Registry of Product Evaluations.
- .8 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act (TDGA), 1992.

#### **1.4 CERTIFICATION**

- .1 The roof contractor must be officially recognized as an authorized contractor by the manufacturer of the water resistance materials, and be accredited by the sheet metal roofing manufacturer and member of the AERMQ.
- .2 Hand to the architect a certification attesting that the roofer is accredited by the manufacturer of the membrane.

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

- .1 Submit proof of manufacturer's CCMC Listing and listing number to Consultant.
- .2 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.
- .3 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .5 Submit product data sheets for roofing felts and insulation. Include:
  - .1 Product characteristics.
  - .2 Performance criteria.
  - .3 Limitations.
- .6 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

- .7 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame.
- .8 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .9 Submit duplicate 300 x 300 mm samples of each sheet metal material.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Unused paint, caulking, and sealing compound materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

## **1.7 STORING AND HANDLING**

- .1 Store materials according to the requirements of the section 01 61 00 - general Requirements concerning products.
- .2 Before their delivery on the construction sit, protect all the materials by covering it with of tight, resistant plastic tarpaulin against the UV, of at least 0.075mm in thickness and attached to the base support of the materials.
- .3 Store up materials in rollers
- .4 Remove from the place of storing only the quantity of materials which will be in work that very day.
- .5 Do not store materials on the completed roof.

## **1.8 IMPLEMENTATION CONDITION**

- .1 Do not install the membranes of modified asphalt when the temperature is lower than 10 degrees Celsius. Interrupt the works during a rain or during a shower of snow.
- .2 The roof support must be dry, clean and free from snow and from ice. Use only dry materials, and apply them only when the conditions atmospheric will not cause infiltration of humidity in the system.

## **1.9 FIRE SAFETY**

- .1 Portable Fire extinguishers: keep on the roof, for every blowtorch, a fire extinguisher for permanent, refillable pressure of 9 kg, approved ULC for use against fires of classes A, B and C. The fire extinguisher must be placed up to 6 m of the blowtorch.
- .2 Never weld directly on the old dry wood.

- .3 Maintain on the spot a fire safety guard during a period of 1 hour after the end of the torch welding works.
- .4 To Respect all the fire security measures sets on by the AMCQ and the manufacturer.

#### **1.10 QUALITY CONTROLE**

- .1 A certificate must be submitted by the manufacturer before the beginning of the works to guarantee that no buckle will be apparent after the installation and in normal dilation conditions. This certificate is conditional in a smooth sub-base and that the installation recommendations of the manufacturer were respected.
- .2 Before the installation of the self-adhesive membrane of the sub-roof, an inspection with written report must be written by the manufacturer in the presence of the installer and of the designated representative to validate the conformity of the subs-base is smooth and ready to receive the sub-roof membrane and the metallic roof cover.
- .3 A meeting between the manufacturer, the installation and the appointed representative must be planned to validate techniques and recommendation of the manufacturer.

#### **1.11 WARRANTY**

- .1 Supply a written guarantee in the name of the owner, of five ( 5 ) years, jointly contractor, roofer and manufacturer, for the total amount of roof works and guaranteeing materials and workforce and a not decreasing guarantee of ten ( 10 ) years of the membrane's manufacturer.
- .2 The guarantee applies to the whole roof as well as to the quality of the execution of the works and to the necessary repairs to correct any imperfection which could arise during indicated period.
- .3 The contractor guarantees by the present that the roof cover and the membranes flashing will remain in position and will preserve their watertightness

### **Part 2 Products**

#### **2.1 SUPPORT PANEL FOR WATERPROOF MEMBRANE**

- .1 Exterior plywood panel, thickness as indicated on the drawings

#### **2.2 SUB-ROOF SELF-ADHESIVE MEBRANE**

- .1 Self-adhesive Membrane of sub-roof with modified asphalt SBS, compatible with the metallic roofing, having the following characteristics:
  - .1 Thickness: 1.0 mm.



- .2 Traction resistance:
    - Longitudinal: 13.3
    - Transverse: 15.4
  - .3 Extension in the break:
    - Longitudinal: 52
    - Transverse: 24
  - .4 Bond to the plywood:
    - In 4.5°C: 500 N/m
    - In 24°C: 1100 N/m
  - .5 steam Permeance:
    - 1.25 ng / Pa.s.m2 (0.022 perm)
  - .6 Superior Face: weaved with trilaminar polyethylene
  - .7 Sub-face: detachable silicone film "Split-back".
- .2 Primer composed of synthetic SBS of recognized resins rubbers, and recommended by the manufacturer of the sub-roof membrane.

## 2.3 PRIMER COATING

- .1 Asphalt primer with volatile solvents for weldable membrane, compatible and recommended by the manufacturer of the vapor barrier.

## 2.4 VAPOR BARRIER MEMBRANE

- .1 Membrane of asphalt elastomer, 2.2 mm in thickness strengthened by a glass veil of 95g / m2, in compliance with the standard ONGC 37 GP 56M, having the following characteristics:
  - .1 Traction resistance:
    - Longitudinal: 11
    - Transverse: 8.5
  - .2 Extension in the break(%):
    - Longitudinal: 4
    - Transverse: 4
  - .3 Resistant to deformation (kN/m):
    - Longitudinal: 1.3
    - Transverse: 1.3
  - .4 Resistant to tear(N): 30
  - .5 Flexibility in the cold:  $\leq -30$
  - .6 Resistant to static punching (N) : 160.
  - .7 Softening point(°C) :  $\geq 110$ :
  - .8 Superior Face: sanded
  - .9 Sub-face: thermal weldable plastic film

## 2.5 METAL SHEETING

- .1 Profiled roofing made with galvanized steel sheet in accordance with the standard ASTM A653 / A653M (last revision):
  - .1 Composed of a steel core rank A, having a minimal elastic limit of 230 Mpa and admitting a maximal constraint of 144 Mpa
  - .2 Coated on every face with a coat of hot zinc, according to the name Z-275 ( G-90), in accordance with the standard ASTM A924 / A924M of hot zinc-aluminum, according to the name AZ-180, in accordance with the standard A792 / A792M, having the following characteristics:
    - .1 Dimension of the panel (profile):  
Length: 1015mm  
Hight: 35mm  
Distance between rib: 338mm
    - .2 Thickness of the nude metal: 0,65 mm (calibre 24).
    - .3 Finished: pre-painted with a system of painting type colorite-HMP
    - .4 Color: bright red, same as existing.
  - .3 Fastener: galvanized, exposed fastener color assorted with the metal roof sheeting

## 2.6 ACCESSORIES

- .1 Sealer type recommended by the manufacturer
- .2 Protective coating: antibase bituminous paint
- .3 Anchoring screw: recommended by the manufacturer
- .4 Touch up paint: recommended by the manufacturer
- .5 Metallic flashing: according to the prescription in section 07 62 00 - Sheet metal flashing and trim
- .6 Closing accessories: metallic closing adapted for the chosen profile, recommended by the manufacturer
- .7 All accessories must be provided by the same manufacturer

## Part 3 Execution

### 3.1 INSTALLATION

- .1 Materials of roof:
  - .1 Sublayer: install the sublayer completely adhered solid substrate according to the recommendations of the manufacturer. Make sure that all the joints overlap and are correctly sealed. Fix with insulating coats to the neighboring surfaces to insure an hermetic construction. Supply a

continuous joint around all the openings of the system of isolated metallic roof

- .2 System of staples: fix staples by means of bindings such as recommended by the manufacturer, to fit the substrate.

.2 Installation of the roof sheeting:

- .1 Install the starter flashing, the drip and the other flashing, metal angle and edges, as presented on the drawings
- .2 Install the outer panels of the prefinished roof according to the appropriate method of construction of the manufacturer, y assuring that the overlapping is and adequate detaling so that the surfaces ar weatherproof. The fasteners must be the same color as the metal roofing sheet.
- .3 When indicated on the approved workshop drawings, fix the coverings of the extremities of the steel sheet of the roof according to the detailed instructions of the manufacturer to form a tight joint. The visible bindings have to be the same color harmonizing with steel sheet roofing.
- .4 Supply formed and cut endcap, that the joints are tested against weather changes and slope changes, as well as in the ridges and in the eaves, as need be.
- .5 Install weatherproof sealents at the junctions of neighboring works as well as in the places indicated on the drawings, in accordance with section 07 92 00 - Joint sealants

### 3.2 SHAPING

- .1 Shape according to drawings and indicated dimensions. Plan, at the joints the necessary expansion for the dilation.
- .2 Pull down the visible edges on their lower face, on a 12 mm width. Assemble elements with tab and fill joints.
- .3 Shape the square, level elements and exactly, in the planned dimensions, so that they are free from any distortion and from any other defect susceptible to distort their appearance or their efficiency.
- .4 In the case of adjoining elements made by metals of different nature, to cover the faces of the elements which have to come into contact of a coat of plastic cement producing a dry film of a thickness of at least 0.2 mm.
- .5 Protect sheets against the oxidation by means of a coat of protective filler applied to the back, according to the indications.

**END OF SECTION**



**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 01 61 00 – Common product requirements.
- .3      Section 04 04 99 – Masonry for minor works.
- .4      Section 07 61 00 – Sheet metal roofing.
- .5      Section 07 92 00 – Joint sealants.
- .6      Section 08 11 00 – Metal doors and frames.

**1.2            REFERENCES**

- .1      The Aluminum Association Inc. (AAI)
  - .1      AAI-Aluminum Sheet Metal Work in Building Construction-2002.
  - .2      AAI DAF45-03, Designation System for Aluminum Finishes.
- .2      American Society for Testing and Materials International (ASTM)
  - .1      ASTM A 167-99(2004), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2      ASTM A 240/A 240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .3      ASTM A 606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
  - .4      ASTM A 653/A 653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5      ASTM A 792/A 792M-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  - .6      ASTM B 32-04, Standard Specification for Solder Metal.
  - .7      ASTM B 370-03, Standard Specification for Copper Sheet and Strip for Building Construction.
  - .8      ASTM D 523-89(1999), Standard Test Method for Specular Gloss.
  - .9      ASTM D 822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

- .3 Canada Green Building Council (CaGBC)
  - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
  - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 Canadian Roofing Contractors Association (CRCA)
  - .1 Roofing Specifications Manual 1997.
- .5 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
  - .2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .6 Canadian Standards Association (CSA International)
  - .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
  - .2 AAMA/WDMA/CSA 101/I.S.2/A440-2008, Standard/Specification for Windows, Doors, and Unit Skylights.
  - .3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .7 Green Seal Environmental Standards
  - .1 Standard GS-03-93, Anti-Corrosive Paints.
  - .2 Standard GS-11-97, Architectural Paints.
  - .3 Standard GS-36-00, Commercial Adhesives.
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .9 South Coast Air Quality Management District (SCAQMD), California State
  - .1 SCAQMD Rule #1113-04, Architectural Coatings.
  - .2 SCAQMD Rule #1168-05, Adhesives and Sealants.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit one copie WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements.

- .3 Shop Drawings:
  - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .4 Samples:
  - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for recycling.

### **Part 2 Products**

#### **2.1 SHEET METAL MATERIALS**

- .1 Zinc coated steel sheet: caliber 24, commercial quality to ASTM A 653/A 653M, with Z275 designation zinc coating.
- .2 Aluminum sheet of commercial quality, plain finish, caliber 24.

#### **2.2 PREFINISHED STEEL SHEET**

- .1 Prefinished steel with factory applied polyvinylidene fluoride.
  - .1 Class F1S.
  - .2 Colour selected by Consultant from manufacturer's standard range.
  - .3 Specular gloss: 30 units +/- in accordance with ASTM D 523.
  - .4 Coating thickness: not less than 22 micrometres.
  - .5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D 822 as follows:
    - .1 Outdoor exposure period 2500 hours.
    - .2 Humidity resistance exposure period 5000 hours.

#### **2.3 PREFINISHED ALUMINUM SHEET**

- .1 Thickness specified for prefinished aluminum sheet applies to base metal.

#### **2.4 ACCESSORIES**

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
  - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.

- .3 Underlay for metal flashing: dry sheathing to CAN/CGSB-51.32.
- .4 Sealants in accordance with section 07 92 00 – Joint sealants.
  - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- .6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.
- .9 Touch-up paint: as recommended by prefinished material manufacturer.
  - .1 Maximum VOC limit 50 g/L to Standard GS-11, in force on January 1<sup>st</sup>.

## **2.5 FABRICATION**

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.
- .3 Form pieces in 2400 mm maximum lengths.
  - .1 Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm.
  - .1 Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

## **2.6 METAL FLASHINGS**

- .1 Form flashings, copings and fascias to profiles indicated of 0,48 mm thick galvanized, prefinished steel anodized aluminum.

## **2.7 REGLETS AND CAP FLASHINGS**

- .1 Form metal cap flashing of 0,48 mm thick sheet metal to be built-in masonry work for base flashings as detailed and in accordance with CRCA FL series details.
  - .1 Provide slotted fixing holes and steel/plastic washer fasteners.
  - .2 Cover face and ends with plastic tape.



## **2.8 EAVES TROUGHS AND DOWNPIPES**

- .1 Form eaves troughs and downpipes caliber 20 galvanized prefinished steel sheet metal, commercial type.
- .2 Sizes and profiles as indicated.
- .3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.
- .4 Color as indicated on drawings.

## **2.9 ALUMINUM FINISHES**

- .1 Appearance and properties of anodized finishes designated by Aluminum Association as Architectural Class 1, Architectural Class 2, and Protective and Decorative: to AAMA/WDMA/CSA-101/I.S.2/A440, for coating Classes 1, 2 and 3 respectively.

## **Part 3 Execution**

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

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

### **3.2 INSTALLATION**

- .1 Install sheet metal work in accordance with CRCA FL series details, AAI-Aluminum Sheet Metal Work in Building Construction and as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal.
  - .1 Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
  - .1 Flash joints using single clip forming tight fit over hook strips, as detailed.
- .5 Lock end joints and caulk with sealant.
- .6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Insert metal flashing under cap flashing to form weather tight junction.
- .8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

- .9 Caulk flashing at cap flashing with sealant.
- .10 Install pans, where shown around items projecting through roof membrane.

### **3.3 EAVES TROUGHS AND DOWNPIPES**

- .1 Install eaves troughs and secure to building at 750 mm on centre with eaves trough spikes through spacer ferrules.
  - .1 Slope eaves troughs to downpipes as indicated.
  - .2 Solder and Seal joints watertight.
- .2 Install downpipes and provide goosenecks back to wall.
  - .1 Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.
- .3 Install splash pans as indicated.

### **3.4 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.5 CLEANING**

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Leave work areas clean, free from grease, finger marks and stains.

**END OF SECTION**

**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 01 61 00 – Common product requirements.
- .3      Section 04 04 99 – Masonry for minor works.
- .4      Section 07 92 00 – Joint sealants.

**1.2            REFERENCES**

- .1      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1      Material Safety Data Sheets (MSDS).
- .2      Underwriter's Laboratories of Canada (ULC)
  - .1      ULC-S115-1995, Fire Tests of Fire stop Systems.
  - .2      CAN-ULC-S101-04, Standard Methods of fire Endurance Tests of Building Construction and Materials.
  - .3      CAN-ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .4      ULC/CAN-124B Coverings, Protective for Foamed Plastic, Standard Method of Test for the Evaluation.
- .3      American Society for Testing and Materials (ASTM):
  - .1      ASTM E84, Surface Burning Characteristics.
  - .2      ASTM E605, Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members.
  - .3      ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

**1.3            DEFINITIONS**

- .1      Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2      Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of non combustible construction or have "0" annular space in buildings of combustible construction.
  - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

#### **1.4 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.
  - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.
- .3 Samples:
  - .1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.
- .4 Quality assurance submittals: submit following in accordance.
  - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
    - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
  - .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

## **1.5 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company specializing in fire stopping and applied fire proofing installations with 5 years documented experience and approved by manufacturer.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Consultant to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building base materials.
  - .4 Review manufacturer's installation instructions and warranty requirements.

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

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate [brand name], [manufacturer], [ULC markings].
- .2 Storage and Protection:
  - .1 Store materials [indoors] [in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
  - .3 Damaged or opened containers will be rejected.
  - .4 Packaging to indicate shelf-life and materials to be applied prior to expiration of shelf-life.
  - .5 Provide temporary enclosures to prevent spray from contaminating air beyond application area.
  - .6 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of fireproofing materials.
- .3 Waste Management and Disposal:
  - .1 Separate waste materials for recycling.

## **1.7 AMBIENT CONDITIONS**

- .1 At temperatures less than 5 degrees C, ensure that 5 degrees C air and substrate temperature is maintained during and for 24 hours after application. Ensure that natural ventilation to properly dry the fireproofing during and

subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the outside.

- .2 Maintain relative humidity within limits recommended fireproofing manufacturer.
- .3 Ensure that natural ventilation to properly dry fireproofing during and subsequent to its application is provided.
- .4 In enclosed areas lacking openings for natural ventilation, provide minimum of [4] air exchanges per hour by forced air circulation.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Fire break and smoke sealer assembly
  - .1 Firebreak joint stopper/ smoke stopper.
  - .2 Self-leveling for horizontal joints.
  - .3 Submarining for vertical joints.
  - .4 Submarining made of liquid ceramic fiber for spraying application in the gypsum wall, for vertical and horizontal joints.
  - .5 Sprayable firebreak/smoke stopper putty for vertical and horizontal joints.
  - .6 Fireproof compound.
  - .7 Self plating concrete made with cement for plugging holes in concrete block walls and concrete walls which can be used for concrete thickness of 25mm to 450mm.
  - .8 Firebreak block to be used in concrete block partitions, dimension of 50x125x200mm
- .2 Firebreak filler material
  - .1 Rock fiber or ceramic fiber insulation, density of 64kg/m<sup>3</sup>, compressed at 25% and squeezed in the opening up to 89mm minimum in depth, metallic ties in Z forme to retain the insulation material in the horizontal openings
  - .2 Firebreak bag to put around the cables

### **2.2 FIREBREAK/SMOKE STOPPER HOMOLOGATION ASSEMBLY**

- .1 Fire break and smoke sealer assembly
  - .1 Material without asbestos, constituting a barrier against flames, smoke, gas and water, meeting or following the standards: CAN\$-S115, CAN-S101 et S102
  - .2 Assembly for a single element penetrating a concrete floor, wall or concrete block wall
  - .3 Assembly for a single element penetrating a gypsum or plaster wall

- .4 Assembly to fill joints between blocks/ gypsum partition and steel deck.
- .5 Assembly for multiple elements (wire channel) penetrating a concrete, masonry, or gypsum assembly.

## **2.3 APPLIED FIRE PROOFING**

- .1 Fire retardant cement coating made with Portland cement (minimum of 65% by density), specially formulated for spraying application labeled with an approved ULC and for the use stipulated in the specifications, formulated without asbestos commercial nor mineral fiber with a minimal average dry density of 350-kg / m3 ( 22lb / pi3 ). Execution
- .2 The fireproof agent will have to answer according to the drawings indications, technical specifications and following test efficiency criteria:
  - .1 The fireproof agent has to contain a mold inhibitor. Tested according to ASTM G21, the fireproof agent will demonstrate a resistance to mold distribution during a period of 21 days for general use(custom) and 60 days for materials installed in plenary sessions.
  - .2 The fireproof agent will have the following characteristics for superficial combustion, according to the standard ASTM E84:
    - Distribution of the flame: 10
    - Development of smoke: 0
  - .3 Water: the water used for the mixture will have to be clean, fresh, drinkable and will have to be exempt from mineral salts or from organic substances in quantity such as it does not affect the implementation of fireproof agent.
  - .4 .Primers: in accordance with manufacturer's recommendations.
  - .5 Equipment: the pulverizing equipment has to be in accordance with the requirements and the recommendations of the manufacturer.

## **Part 3 Execution**

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

- .1 Conformity: conform to the requirements, the recommendations and the written specifications of the manufacturer, including in any available technical bulletin, in the instructions relative to the handling, to the storing and to the implementation of the products, and to the indications on the data sheets.

### **3.2 DEVELOPMENT WORK ( FIREBREAK PROTECTION)**

- .1 Examine the dimension and the state of the space to fill to determine the thickness of the necessary material and the mode of implementation to use.
  - .1 Make sure that surfaces are clean, dry and not frozen.
- .2 Prepare the surfaces which will be put in contact with firebreak and smoke stopper materials, according to the manufacturer's instructions.

- .3 Insure the integrity of the caulking around the pipes and conduits crossing the firebreak partitions.
- .4 If necessary, cover the adjacent surfaces to protect them from the color and from spatters, and free them, once the works has ended, of unwanted spots or deposits.

### **3.3 PREPARATION (APPLIED FIRE PROOFING)**

- .1 Make sure that the underlying surfaces are free from substances susceptible to damage the adhesion of the fireproofing.
- .2 Make sure that the painted surfaces of the support are compatible with the applied fireproofing, and that they possess the characteristics of adhesion required to receive the product.
- .3 Remove the incompatible materials which are on the surface of the support.
- .4 Before applying the product, making sure that we have already put elements intended to penetrate into the fireproofing cover.
- .5 Make sure that conduits, pipes, material or other elements susceptible to hamper the realization of the fireproofing cover are put only after the application of the product.
- .6 Verify if the already executed works are fit to receive the works described in the present
- .7 The application of the fireproof agent will begin only when the general contractor and the applicator of the fireproof agent will have examined the surfaces to determine if these are capable of receiving the fireproof agent.
- .8 Confirm the compatibility of the basis material with the fireproof agent.
- .9 In the case of particular conditions, follow the recommendations of the manufacturer.
- .10 make sure that all the works that must be realized before the implementation of the thermal barrier are done. These works include what follows, without limiting itself to it however: fixations, hangers and support sleeves and other elements which have to cross the fireproof agent.
- .11 Plan the masking, coating and other satisfactory ways of protections so as to protect surfaces against the projections of the fireproof agent

### **3.4 IMPLEMENTATION (APPLIED FIRE PROOFING)**

- .1 If the manufacturer recommends it, coat the support with an adhesive or a primer.



- .2 The fireproofing product must be kept dry until its being used. Bags containing the material must be covered and stored off ground and taken away from the wet surfaces. Any bag having been exposed to the water before use must be disposed of. The material must be used before the expiration date.
- .3 The application of the applied fireproof agent must be made according to the manufacturer's instructions.
- .4 Pulverize the fireproof agent on the surface, in multiple coats or successive stages as one needs to obtain a monolithic coat of required thickness and deliberate uniform texture, with a minimal average dry density of 350 kg / m<sup>3</sup> (22lb/ft<sup>3</sup>).
- .5 Never break of the description of the applicable approved design.
- .6 Work inside the limits of temperature, humidity and other conditions specified by the manufacturer.
- .7 Maintain a temperature of the base materiel and ambient air of at least 4,5°C (40°F) before, during and after the application of the pulverized fireproof agent. If need be, the general contractor will warm the working zone to maintain the prescribed temperatures.

### **3.5 INSTALATION OF THE FIREBREAK AND SMOKE STOPPER ASEMBLY**

- .1 Install the materials of the firebreak and the smoke stopper sets as well as the related component elements according to the requirements from the test certificate approved by Warnock Hersey and the manufacturer's instructions.
- .2 Fill the space and free spaces around pipes or objects which cross altogether or partially the firebreak and smoke stopper sets and fill also the joints of the sets not crossed by pipes or objects to insure the continuity of the protection barrier and protect the integrity of the fire resistant partition.
- .3 If necessary, install temporary devices of restraint and remove them only when materials reached a sufficient resistance and once the cure period has ended.
- .4 Shape the visible surfaces or smooth them with the use of a trowel until obtaining a smooth finish
- .5 Remove as soon as possible the excess sealing product according to the progress of the works and as soon as these have ended.

### **3.6 LOCATION OF THE FIREBREAK AND SMOKE STOPPER ASEMBLY**

- .1 at openings and penetrations in fire-resistance rated assemblies either in specification or on drawings. A typical schedule follows:
  - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

- .2 Top of fire-resistance rated masonry and gypsum board partitions.
- .3 Intersection of fire-resistance rated masonry and gypsum board partitions.
- .4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
- .5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
- .6 Openings and sleeves installed for future use through fire separations.
- .7 Around mechanical and electrical assemblies penetrating fire separations.
- .8 And any other different place where the fire resistance integrity is affected by the works

### **3.7 FIELD QUALITY CONTROL**

- .1 Inspect: before hiding or covering the materials or firebreak assemblies, inform the Consultant that the works are ready for inspection.
- .2 Controls made on the spot by the manufacturer.
  - .1 Obtain the report written by the manufacturer confirming the conformity of the works with the criteria specified in what concerned the handling, the implementation and the application of the products as well as the protection and the cleaning of the work, then to submit this report according to the article DOCUMENTS / ELEMENTS TO BE SUBJECTED(SUBMITTED), of the PART(PARTY) 1.
  - .2 The manufacturer has to formulate recommendations as for the use of one or several products, and make periodic visits to verify if the implementation was realized according to its recommendations.

### **3.8 CLEANING**

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

**END OF SECTION**

**Part 1            General**

**1.1            SECTION CONTENT**

- .1        Materials, preliminary documents and methods of implementation associated to the sealing and weatherstripping products.

**1.2            RELATED REQUIREMENTS**

- .1        Section 01 33 00 - Submittal procedures.
- .2        Section 01 61 00 - Common product requirements.
- .3        Section 05 50 00 – Metal fabrications.
- .4        Section 07 61 00 – Sheet metal roofing.
- .5        Section 07 62 00 – Sheet metal flashing and trim.
- .6        Section 08 11 00 – Metal doors and frames.
- .7        Section 09 21 16 – Gypsum board assemblies.

**1.3            REFERENCES**

- .1        American Society for Testing and Materials International, (ASTM)
  - .1        ASTM C 919-[02], Standard Practice for Use of Sealants in Acoustical Applications.
- .2        Canadian General Standards Board (CGSB)
  - .1        CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
  - .2        CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .3        CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
  - .4        CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
  - .5        CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3        Department of Justice Canada (Jus)
  - .1        Canadian Environmental Protection Act, 1999 (CEPA).

- .4 General Services Administration (GSA) - Federal Specifications (FS)
  - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

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

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's product to describe.
  - .1 Caulking compound.
  - .2 Primers.
  - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Submit duplicate samples of each type of material and colour.
- .5 Cured samples of exposed sealants for each color where required to match adjacent material.
- .6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Instructions to include installation instructions for each product used.

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

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Divert unused joint sealing material from landfill to official hazardous material collections.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .9 Fold up metal banding, flatten, and place in designated area for recycling.

## **1.7 SITE CONDITIONS**

- .1 Environmental Limitations:
  - .1 Do not proceed with installation of joint sealants under following conditions:
    - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.
    - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
  - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

## **1.8 ENVIRONMENTAL REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Ventilate area of work by use of approved portable supply and exhaust fans.

## **1.9 GUARANTEE**

- .1 Supply a written guarantee, emitted in the name of the owner, guaranteeing that the works specified in the present section will be exempt from any material or labour defects, in particular against the weatherproofing losses, the fissuring, the disintegration, the consistency losses, the contraction, colors, the loss of adhesion and the tarnishing of the neighboring surfaces, for a period of five ( 5 ) years as from the date of the definitive reception.
- .2 The guarantee has to cover the cost of any expense caused by the repair of the defects and any other damage to the building resulting from work defects of this section.
- .3 The guarantee form must be approved by the architect and the owner.

## **Part 2 Products**

### **2.1 SEALANT MATERIALS**

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
- .3 Where sealants are qualified with primers use only these primers.

### **2.2 SEALANT MATERIAL DESIGNATIONS**

- .1 Primer : type recommended by the sealing product manufacturer
- .2 Non-corrosive and soil-resistant cleaning products Compatible with joints materials and with the sealing products, and recommended by the all the products manufacturer.
- .3 Tightness products :
  - .1 The tightness products, with the exception of those who are described in the standards CAN / ONGC-19.1 and CAN / ONGC-19.18, have to appear on the list of approved products, published by the tightness products homologation commission, the ONGC (CGSB). When it is about

tightness products were approved with only a primary component, only this primary component must be used with the tightness products.

- .2 Product no.1 :
  - .1 three components terpolymère epoxy polyurethane sealing mastic, with chemical polymerization colors choice by the architect and in compliance with the standard CAN / ONGC-19.24-M90.
  - .2 Applications :
    - .1 Joints between exterior door and window frames, curtain walls and louvers or others and the outer masonry walls.
    - .2 Joints between concrete works
    - .3 All the various joints required in the plans but not covered by other section.
  - .3 Product no.2
    - .1 Polyurethane sealing joints, multi-components, auto-smoothing, color choice made by the architect and in compliance with the U.S. Federal Specification TT-S-00227E, ASTM C920-79, type M, Rank P, Class 25, SS-S-200D, type H.
    - .2 Applications :
      - .1 Recess or controle joint in ceramic, granite, concrete floors.
      - .2 Horixontal joints subjected to high traffic, such as doorsteps, pavement, rampes, etc.
  - .4 Product no. 3
    - .1 One component terpolymère acrylic sealent, colour choice made by the architect and in corresponding in the standard ONGC-19-GP.5M-M76.
    - .2 Applications :
      - .1 Joints between interior door and glass partitions or others and materials other then gypsum.
      - .2 Joints between the gypsum and window frames and curtain walls elements.
      - .3 Joints between gypsum and metal fabrication.
  - .5 Product no. 4
    - .1 Fast drying, minimal recess, paintable latex acrylic sealent colour choice made by the architect
    - .2 Applications :
      - .1 Joints between interior door and glass partitions, between gypsum board or plaster coating.
      - .2 Unless otherwise specified, use inside where sealent must be painted.
  - .6 Product no. 5
    - .1 Fireproof sealent : see section 07 84 00 - Fire stopping

- .4 The tightness and weatherstripping products can't contain the following components nor be made with these: aromatic solvents, fibers of talc or asbestos, formaldehyde, halogenic solvents, mercury, lead, cadmium, hexavalent chromium, barium and by-products, with the exception of the sulfate of barium.
- .5 With the aim of minimizing health risks and maximizing the products performance, it is important that these are accompanied with detailed instructions concerning the method of application and necessary information concerning the methods of waste elimination.
- .6 The weatherstripping products which release strong smells, which contain toxic chemicals or which are not certified as being of a type resisting molds must not be used in the air treatment equipments.
- .7 If we cannot do otherwise then to use toxic products, restrict the use where places where the emanations can be evacuated outside or in places where they will be confined behind vapor and air barriers, or apply them several months before the place is occupied so as to allow the evacuation of the emanations over the longest possible period.

## **2.3 SUPPORT MATERIELS**

- .1 Extruded foam back joint, circular closed cell, density 32,04kg / m<sup>3</sup>.
- .2 Oversize elements from 30 to 50 %, compatible with primers and tightness products.
- .3 Anti-adhesion products : anti-adhesion ribbon made with not stick polyethylene on the tightness products.

## **2.4 TIGHTNESS PRODUCTS COLOR**

- .1 In general, the color of every tightness product, choice made by the architect, will match the color of the neighboring surfaces (submit a color charter).

## **2.5 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .2 Primer: as recommended by manufacturer.

## **Part 3 Execution**

### **3.1 PROTECTION**

- .1 Protect installed Work of other trades from staining or contamination.



### **3.2 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

### **3.3 PRIMING**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

### **3.4 BACKUP MATERIAL**

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

### **3.5 MIXING**

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

### **3.6 APPLICATION**

- .1 Sealant.
  - .1 Apply sealant in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.
  - .4 Apply sealant using gun with proper size nozzle.
  - .5 Use sufficient pressure to fill voids and joints solid.
  - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.

- .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing.
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleanup.
  - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
  - .3 Remove masking tape after initial set of sealant.

**END OF SECTION**

**Part 1        General**

**1.1           RELATED REQUIREMENTS**

- .1        Section 01 33 00 – Submittal procedures.
- .2        Section 01 61 00 – Common product requirements.
- .3        Section 07 92 00 – Joint sealants.
- .4        Section 08 71 00 – Door hardware.
- .5        Section 09 91 99 – Painting for minor works.

**1.2           REFERENCES**

- .1        American Society for Testing and Materials International (ASTM)
  - .1        ASTM A 653/A 653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2        ASTM B 29-03, Standard Specification for Refined Lead.
  - .3        ASTM B 749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .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).
  - .2        LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .3        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
  - .2        CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .4        Canadian Standards Association (CSA International)
  - .1        CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2        CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .5        Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1        CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
  - .2        CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

- .6 National Fire Protection Association (NFPA)
  - .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
  - .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.
- .7 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
  - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
  - .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
  - .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

### 1.3 DESIGN STANDARD

- .1 Frame installed in the outer walls must be designed in a way that elements (doors and frame) can dilate and contract freely when their surface is submitted to temperatures going from 35 ° C to 35 ° C.
- .2 The maximal deflection of the closing elements of the steel openings under an overload due to the winds of 1.2 kPa does not have to exceed 1/175 of the bay.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 The submitted workshop drawing has to carry the seal and the signature of a recognized competent engineer authorized to practice in Canada, in the province of Quebec.
  - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, louver, arrangement of hardware and fire rating and finishes.
  - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing fire rating finishes.
  - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
  - .5 Submit test and engineering data, and installation instructions.
- .4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

## **1.5 REQUIREMENTS OF REGULATORY AUTHORITIES**

- .1 Doors and frame with fire resistance degree: must be approved by an organization accredited by the Canadian Council of the standards, according to the requirements of the standards CAN4-S104M and NFPA 252 as for the quotations and prescribed indicated fire resistance degrees, and carrying the label of the organization in question.
- .2 Approved firebreaks frame must be planned in the case of openings that must be filled by elements with a fire resistance degree, according to the list or the established list. Products must be approved according to the standards CAN4-S104, ASTM E 152 or NFPA 252, be approved by a recognized organization on a national scale and insuring a factory inspection service, and to be built according to details indicated in the procedures of follow-up and the workers manual of shop inspection published by the body of ratification and supply to the various manufacturers.

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

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

## **Part 2 Products**

### **2.1 DESIGN STANDARD**

- .1 Doors and the ironworks and hardware system must be designed to respect or exceed the standards of the industry (Door and Access Systems Manufacturer Association) in term of resistance against the wind loads.

### **2.2 MATERIALS**

- .1 Hot dipped galvanized steel sheet: according to the standard ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts. Use this type for interior steel doors and frames
  - .1 Thickness of the raw metal, panels of the interior doors: 1,2 mm
  - .2 Thickness of the raw metal, panels of the exterior doors: 1,2 mm
  - .3 Thickness of the raw metal, side of hinges and lock reinforcement: gauge 10
  - .4 Thickness of the raw metal, opposite side of hinges: gauge 14
  - .5 Plan reinforcement for door closer: gauge 14
- .2 Reinforcement: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75 or Z275 according to application and standard ASTM A653M.
- .3 Doors with fastened joints: sealing fireproof adhesive, with polychloroprene with incorporated load of resins, high viscosity.

## **2.3 DOOR CORE MATERIALS**

- .1 Honeycomb core construction:
  - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m<sup>3</sup> minimum sanded to required thickness. For interior use.
- .2 Reinforced core: panel glued to an isolated core. For exterior use
  - .1 Polyurethane core: rigid panels of modified polyisocyanurate, closed alveoli, by a 32 kg / m<sup>3</sup> density, according to the standard CGSB 51 GP 21M.
- .3 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 60 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, ASTM E 152 or NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

## **2.4 ADHESIVES**

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 polystyrene and polyurethane core: heat resistant contact adhesive, with epoxy resins, with low viscosity.
- .3 Doors with fastened joints: fireproof sealing adhesive, polychloroprene base with incorporated load of resins, high viscosity.

## **2.5 PAINT**

- .1 Field paint steel doors and frames in accordance with Section 09 91 99 – Painting for minor work, Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.
- .2 Touch-up prime CAN/CGSB-1.181.

## **2.6 ACCESSORIES**

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .3 Metallic paste filler: to manufacturer's standard.
- .4 Fire labels: metal rivited.
- .5 Sealant: according to section 07 92 00 – joint sealants.

- .6 Make provisions for glazing as indicated and provide necessary glazing stops.
  - .1 Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless steel screws.
  - .2 Design exterior glazing stops to be tamperproof.

## **2.7 FRAMES FABRICATION GENERAL**

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: welded with thermally broken type construction.
- .4 Interior frames: welded type construction.
- .5 Thickness of the metal of the frame:
  - .1 Thickness of the basic metal for building frame of less than 1200mm of width: 1,6 mm.
  - .2 Thickness of the basic metal for building frame more than 1200mm of width: 2,6 mm.
- .6 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .7 Protect mortised cutouts with steel guard boxes.
- .8 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .9 Manufacturer's nameplates on frames and screens are not permitted.
- .10 Conceal fastenings except where exposed fastenings are indicated.
- .11 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .12 Insulate exterior frame components with polyurethane insulation.

## **2.8 FRAME ANCHORAGE**

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

## **2.9 FRAMES: WELDED TYPE**

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

## **2.10 DOOR FABRICATION GENERAL**

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: insulated core construction. Interior doors: honeycomb construction.
- .3 Fabricate doors with longitudinal edges locked seam. Seams: visible.
- .4 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E 330.
- .5 Blank, reinforce, drill doors and tap for mortised, templated hardware.
- .6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .7 Reinforce doors where required, for surface mounted hardware. Provide flush PVC top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .9 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN4-S104, ASTM E 152 NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .10 Manufacturer's nameplates on doors are not permitted.



## **2.11 DOORS**

- .1 Form face sheets for exterior doors from 1.6 mm sheet steel with polyurethane core laminated under pressure to face sheets.
- .2 Form face sheets for interior doors composed of sheet steel core laminated under pressure to face sheets.
  - .1 Thickness of the basic metal; 1,2 mm
  - .2 Thickness of the basic metal for internal doors of more of 2 135 mm in height or more than 1 200 mm in width: 1,6 mm

## **2.12 THERMALLY BROKEN DOORS AND FRAMES**

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break. Profiles of the top and the bottom of the outside doors have to be of outcrop closed by one "U" inverted, minimal thickness of 1,9mm or more according to the thickness of the metal of the door and has to be of the same type of metal as the door, with any groove welded, filled and sanded, groove towards the outside.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Frame and doors have to contain an insulating material.

## **Part 3 Execution**

### **3.1 INSTALLATION GENERAL**

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

### **3.2 FRAME INSTALLATION**

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

- .5 Caulk perimeter of frames [between frame and adjacent material].
- .6 Maintain continuity of air barrier and vapour retarder.

### **3.3 DOOR INSTALLATION**

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor[and thresholds] as follows.
  - .1 Hinge side: 1.0 mm.
  - .2 Latchside and head: 1.5 mm.
  - .3 Finished floor and sill: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

### **3.4 FINISH REPAIRS**

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

### **3.5 GLAZING**

- .1 Install glazing for doors and frames with the manufacturer.

### **3.6 CLEANING**

- .1 Clean surfaces and adjacent finishes

**END OF SECTION**

**Part 1            General**

**1.1               RELATED REQUIREMENTS**

- .1       Section 01 33 00 – Documents et échantillons à soumettre.
- .2       Section 01 61 00 – Exigences générales concernant les produits.
- .3       Section 08 11 00 – Portes et bâtis en métal.

**1.2               REFERENCES**

- .1       Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
  - .1       CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.
- .2       American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
  - .1       ANSI/BHMA A156.1-2000, American National Standard for Butts and Hinges.
  - .2       ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
  - .3       ANSI/BHMA A156.3-2001, Exit Devices.
  - .4       ANSI/BHMA A156.4-2000, Door Controls - Closers.
  - .5       ANSI/BHMA A156.5-2001, Auxiliary Locks and Associated Products.
  - .6       ANSI/BHMA A156.6-2005, Architectural Door Trim.
  - .7       ANSI/BHMA A156.8-2005, Door Controls - Overhead Stops and Holders.
  - .8       ANSI/BHMA A156.10-1999, Power Operated Pedestrian Doors.
  - .9       ANSI/BHMA A156.12-2005, Interconnected Locks and Latches.
  - .10      ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.
  - .11      ANSI/BHMA A156.14-2002, Sliding and Folding Door Hardware.
  - .12      ANSI/BHMA A156.15-2006, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
  - .13      ANSI/BHMA A156.16-2002, Auxiliary Hardware.
  - .14      ANSI/BHMA A156.17-2004, Self-closing Hinges and Pivots.
  - .15      ANSI/BHMA A156.18-2006, Materials and Finishes.
  - .16      ANSI/BHMA A156.19-2002, Power Assist and Low Energy Power - Operated Doors.
  - .17      ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.

**1.3               ACTION AND INFORMATIONAL SUBMITTALS**

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

- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit for review and acceptance of each unit.
  - .2 Samples will be returned for inclusion into work.
  - .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
  - .4 After approval samples will be returned for incorporation in Work.
- .4 Hardware List:
  - .1 Submit contract hardware list.
  - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

#### **1.5 QUALIFICATIONS**

- .1 To insure a minimum of competence, only firms that have in their employment at least (1) hardware consultant AHC certified (Architectural Consultant Hardware) in order with the DHI (Door and hardware Institute) will be admitted for tendering for this project.

### **Part 2 Products**

#### **2.1 HARDWARE ITEMS**

- .1 Use one manufacturer's products only for similar items.

## **2.2 REQUIREMENTS**

- .1 Except in particular cases prescribed in the hardware schedule, all the hardware assemble required for the present works will be penitentiary type. For to the finish refer to the list.
- .2 Submit a hardware list according to the section 01 33 00 - Submittal procedures to submit to the prescriptions of the of hardware table and schedule article 5.0. The hardware lists will have to include for coordination to the installation the written numeric descriptions of each of the items and as well as any written notes on the hardware schedule, such as specified in the present document.
- .3 The hardware schedule is supplied as guide to establish the type, the function, the quality and the article's required minimal weight, but must not be interpreted as being a list of quantity. The contractor thus has to verify the list of the plans and has to supply any additional hardware article which is not in this list, but all the same required to complete the doors installation.
- .4 Fabricate hardware according to the current standard ANSI.
- .5 In the absence of a ANSI standard, hardware must be able to fill its function and be a recognized usage.
- .6 Submit for approval according to the section 01 33 00 - Submittal procedures, elevation of each door that include electrified components and including the diagrams of the detailed electrical connections point by point and the way of functioning. These documents will be used by the professionals during installation and copies will be put handed to the owner for reference later.
- .7 All the products of the same kind has to come from the same manufacturer.

## **2.3 FASTENINGS**

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.
- .6 Even if they are optionally supplied by the manufacturers, the auto-tapping and/or auto-piercing screws will not be tolerated for the installation of the hinges, panic bar, door closer and door stopper. All these items must be installed with screws supplied by the manufacturers and will have been manufactured in the doors and frames beforehand.

## **2.4 PROTECTION AGAINST VANDALISM**

- .1 Even if they are not specifically described in the present section or indicated in the hardware schedule, supply the protection part like bolts protectors, hinges with non-removable inserts, etc., for all the outside doors.

## **Part 3 Execution**

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

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply to the door and frame manufacturers the installation gauge and the complete instructions which will allow them to prepare their products to receive the hardware prescribed in the present section.
- .3 Supply, with every hardware articles, installation instructions developed by the manufacturer.
- .4 Install hardware parts in the normalized positions corresponding to the requirements of steel frames and doors of the Canadian Manufacturers Association.
- .5 The installation will be made by installers having worked with this type of hardware. It includes the adjustment and the operation verification of the various elements during the installation and before the acceptance of the works.

### **3.2 INSTALLATION**

- .1 Install hardware articles in the normalized positions corresponding to the requirements of Canadian Metric Guide for Steel Doors and Frames ( Modular Construction), developed by the Canadian Association of the manufacturers of steel doors.
- .2 Install the hardware plumb, with screws and bolts supplied by the manufacturer and according to the instructions. Parts will be built in flush with the faces of doors. Adjust the moving parts so that doors work with ease.
- .3 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .4 Only use the fastening devices supplied by the manufacturer. The failure to respect the requirements can compromise the guarantees and invalidate the seal of approval. The fast installation fastening devices, unless they are specifically supplied by the manufacturer, will not be accepted.
- .5 When the Professional will make the request), remove the locks temporary rotors and replace them with the permanent rotors, then verify all the locks operations.

- .6 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .7 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .8 Supply manufacturers' instructions for proper installation of each hardware component.
- .9 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

### **3.3 ADJUSTING**

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

### **3.4 RESPONSIBILITY**

- .1 The finishing hardware will be suitably adapted to the specified use and it will suit in the designated place. If the case where the indicated, specified or demanded hardware do not meet the planned or required demanded, a modification can suit or adapt itself to the indicated place. The hardware supplier will quickly look for the necessary correction or for the modification in advance to avoid a delay in the manufacturing and the delivery of the hardware.
- .2 During the construction, he will make the necessary checks to make sure that the finishing hardware which he supplied is suitably installed and will inform the contractor about it.
- .3 The included hardware set in the present schedule were prepared by the architect and his professional from documents and the available information during the conception. The subcontractor retained to supply the hardware sets has the obligation to coordinate these with the plans which will be submitted for constructions and also has the obligation to make sure that the hardware sets are compliant to the requirements of the CNB-2005, standards firebreak and according to the rules of the art while respecting the spirit of the present project.

### **3.5 CLEANING**

- .1 Once the installation finished, proceed to cleaning the construction site to eliminate dirt and accumulated fragments, attributable to building work and to the environment.

- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and security barrier.

### 3.6 HARDWARE SCHEDULE

- Hardware set 01 / Door: 1

| QTY  | DESCRIPTION   | FINISH | MANUFACTURER       |
|------|---|--------|--------------------|
| 4 ** | Stainless steel security hinge<br>4-1/2FM-ICS   | 630    | Southern Folger    |
| 1    | <i>83K series cylindrical lock supply by the owner and install by the general contractor</i>  |        | <i>Best</i>        |
| 1    | Latch astragal<br>5000T x Tork  | 626    | Trimco/BBW         |
| 1    | Detention deadbolt with mounting plate<br>16-6 x HM x 10-4B x keyed to key 209A   |        | Folger Adam        |
| 1    | Heavy-duty adjustable security door closer with spring<br>stop parallel arm<br>CPS-7570<br>(Arm shoe install offset of the weatherstrip at frame<br>header) | 689    | Norton             |
| 1    | Aluminum threshold with thermal break, stop and gasket<br>525A x 36" x Tork   | 719    | Zero International |
| 1    | Silicone base self adhesive gasket<br>488S-BK x 1/36" (Head) + 2/84" (Jambs)  | Black  | Zero International |
| 1    | Compact weatherstrip with rigid neoprene insert<br>31AA x 1/36" (Head) + 2/84" (Jambs) x Tork   | 628    | Zero International |
| 1    | Weatherstrip / Door sweep with heavy-duty rigid neoprene<br>insert<br>539AA x 36" x Tork  | 628    | Zero International |

Note:

- \*\* 4 hinges for a door of 84" high.



- Hardware set 02 / Door: 1

| QTY  | DESCRIPTION  | FINISH | MANUFACTURER       |
|------|--|--------|--------------------|
| 4 ** | Stainless steel security hinge<br>4-1/2FM-ICS  | 630    | Southern Folger    |
| 1    | <i>83K series cylindrical lock supply by the owner and install<br/>by the general contractor</i> |        | <i>Best</i>        |
| 1    | Latch astragal<br>5000T x Tork   | 626    | Trimco/BBW         |
| 1    | Detention deadbolt with mounting plate<br>16-6 x HM x 10-4B x keyed to key 209A                  |        | Folger Adam        |
| 1    | Heavy-duty adjustable security door closer with spring<br>stop parallel arm<br>CPS-7570          | 689    | Norton             |
| 1    | Silicone base self adhesive gasket<br>488S-BK x 1/36" (Head) + 2/84" (Jambs)                     | Black  | Zero International |

Note:

- \*\* 4 hinges for a door of 84" high.

**END OF SECTION**



**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 33 00 – Submittal procedures.
- .2      Section 01 61 00 – Common product requirements.
- .3      Section 06 08 99 – Rough carpentry for minor works.
- .4      Section 07 27 00 – Vapour and air barriers system.
- .5      Section 07 92 00 – Joint sealants.
- .6      Section 09 91 99 – Painting for minor works.

**1.2            REFERENCES**

- .1      Aluminum Association (AA)
  - .1      AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2      ASTM International
  - .1      ASTM C 475-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - .2      ASTM C 514-04(2009e1), Standard Specification for Nails for the Application of Gypsum Board.
  - .3      ASTM C 557-03(2009)e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
  - .4      ASTM C 840-08, Standard Specification for Application and Finishing of Gypsum Board.
  - .5      ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
  - .6      ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - .7      ASTM C 1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
  - .8      ASTM C 1280-99, Standard Specification for Application of Gypsum Sheathing.
  - .9      ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
  - .10     ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.

- .11 ASTM C 1396/C 1396M-09a, Standard Specification for Gypsum Wallboard.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
  - .1 AWCI Levels of Gypsum Board Finish-97.
- .4 Canada Green Building Council (CaGBC)
  - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
  - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .5 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
  - .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit for review and acceptance of each unit.
  - .2 Samples will be returned for inclusion into work.
  - .3 Submit duplicate 300 x 300 mm size samples of gypsum board and 300 mm long samples of corner and casing beads.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Maintain the ambient temperature at 10 degrees Celsius minimum and maximum 21 degrees Celsius during 48 hours before and during the installation and the joint plastering of the plasterboards, and during at least 48 hours after the completion of joints.
- .2 Install plasterboards and plaster the joint on a dry surface that is not covered in frost.

- .3 Insure a good ventilation in the areas of the building where plasterboards are installed to evacuate the excessive humidity which could prevent the drying of the plaster material for the joint immediately after its application.

## **1.5 AMBIENT CONDITIONS**

- .1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

## **1.6 INSTALATION REFERENCE**

- .1 Unless more restrictive and opposite indication to documents, execute the works according to the recommendations contained in " Manuel of construction of Gypsum CGC ", last edition (publishing).

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Standard plasterboard and fireproofing plasterboard:
  - .1 According to standard ASTM C36 and ASTM D3273, the 13 and 16 mm in thickness, the 1200 mm in width and of the maximal useful length, with squared edges in the extremities and disentangled edges on the sides.
  - .2 casing beads, cornice cap, reassess joints and borders: according to the standard ASTM C1047, in strong paper ribbon glued on a resistant metallic rustproof band; a length
- .2 Expansion joint molding on the big gypsum surfaces
- .3 Nails : according to ASTM C514 standard.
- .4 Steel drilling screw: according to ASTM C1002 standard.
- .5 Tightness products: in compliance with the section 07 92 00 – joint sealants.
- .6 Sealants products: in compliance with the section 07 92 00 – joint sealants.
- .7 Joint compound: according to ASTM C475 standard, without asbestos
- .8 Access trapdoor supplied by the electromechanical subcontractors

## **2.2 FINISHING**

- .1 Smooth Finish: patching cement and primer, without asbestos, standard white, in compliance with the recommendations of the manufacturer of plasterboards.

## **Part 3 Execution**

### **3.1 ERECTION**

- .1 Do application and finishing of gypsum board to ASTM C 840 except where specified otherwise.
- .2 Do application of gypsum sheathing to ASTM C 1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring, perimeter of openings for access panels, light fixtures, diffusers, grilles, as the case may be.
- .7 install furs intended for the fixation plasterboard compositing the sheeting of the vertical partitions up to the hanging ceiling or up to the real ceiling, as the case may be.
- .8 Install wall furring for gypsum board wall finishes to ASTM C 840, except where specified otherwise.
- .9 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .10 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .11 Erect drywall furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

### **3.2 APPLICATION**

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply layer gypsum board to wood furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.

- .1 Single-Layer Application:
  - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840.
  - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .2 Double-Layer Application:
  - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
  - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
  - .3 Apply base layers at right angles to supports unless otherwise indicated.
  - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .3 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .4 install the fire resistant plasterboards in the identified places. Apply fireproofing products around all the openings in the plasterboard to protect the integrity of the fire resistant assembly, such as required.
- .5 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .6 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .7 Install gypsum board with face side out.
- .8 Do not install damaged or damp boards.
- .9 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

### 3.3 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .2 Install casing beads around perimeter of suspended ceilings.

- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Provide continuous polyethylene dust barrier behind and across control joints.
- .6 Locate control joints where indicate at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.
- .7 Install control joints straight and true.
- .8 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .9 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .10 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .11 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .12 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .13 Apply two coats of joint compound before applying the finishing coat.
- .14 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .15 Mix joint compound slightly thinner than for joint taping.
- .16 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks. The degree of finish must be of type 4
- .17 Allow skim coat to dry completely. Remove edges by sanding slightly or by slightly passing a damp cloth
- .18 Degrees of finish: drown the ribbon installed on joints and internal angles in joint compound and apply three distinct coats of compound on the joints, angles and screw head and other used accessories. The pointed surfaces must be smooth and free from tool marks and from dents.



- .19 Apply a thin layer compound on the entire surface of the sheeting installed for the curved surfaces and the adjacent partitions (perpendicular) to the fenestration.
- .20 Splice corners and intersections together and secure to each member with 3 screws.
- .21 Insure the protection of gypsum board to guarantee that they are not damaged nor deteriorated upon the substantial completion date.

**END OF SECTION**



**Part 1            General**

**1.1            REFERENCES**

- .1    Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1        Material Safety Data Sheets (MSDS).
- .2    The Master Painters Institute (MPI)
  - .1        Architectural Painting Specification Manual - current edition.
  - .2        Maintenance Repainting Manual - current edition.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1        Submit data sheets and instructions required for every type of paint or coating entering the realization of the finish.
  - .2        Submit data sheets required with regard to the application or to the use of the paint thinner.
  - .3        Submit in duplicate the data and instructions sheet required for the term Information system on hazardous materials used in the work ( SIMDUT), which have to be in accordance with this system, according to the section 01 33 00 - Submittal procedures to be submitted. Documents has to indicate the rate of COV emission of the products, during the application and the cure.
  - .4        Submit manufacturer's instructions, printed product literature and data sheets for paint and coating products and include product characteristics, performance criteria, physical size, finish and limitations.
  - .5        Submit the instructions supplied by the manufacturer concerning the application and the implementation.

**1.3            DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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        Provide and maintain dry, temperature controlled, secure storage.
  - .2        Store painting materials and supplies away from heat generating devices.
  - .3        Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.

.4 Fire Safety Requirements:

- .1 Supply 1 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
- .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

**1.4 SITE CONDITIONS**

.1 Heating, Ventilation and Lighting:

- .1 Ventilate enclosed spaces.
- .2 Co-ordinate use of existing ventilation system with Consultant and ensure its operation during and after application of paint as required.
- .3 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

- .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
- .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.

.3 Additional application requirements:

- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
- .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Consultant such that painted surfaces will have dried and cured sufficiently before occupants are affected.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Supply paint materials for paint systems from single manufacturer.
- .2 Conform to latest MPI requirements for painting work including preparation and priming.
- .3 Materials in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.
  - .1 Use MPI listed materials having E2 and E3 rating where indoor air quality requirements exist.

## 2.2 COLOURS

- .1 All the choices of colors and shines of paint dye and varnish will be made by the consultant for all the painted, oyed and varnished elements in the project. The quantities, the locations and the trimmings of colours will be completely chosen by the consultant.
- .2 The contractor has to plan:
  - .1 Walls : three (1) colours.
  - .2 Door and frame : two (1) colours.
  - .3 Ceilling: one (1) colours.

## 2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations. Obtain written approval from Consultant for tinting of painting materials.
- .2 Use and add thinner in accordance with paint manufacturer's recommendations.
  - .1 Do not use kerosene or similar organic solvents to thin water-based paints.
- .3 Thin paint for spraying in accordance with paint manufacturer's written recommendations.
- .4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

## 2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

| Gloss level category              | Gloss @ 60<br>degrees | Sheen @ 85<br>degrees |
|-----------------------------------|-----------------------|-----------------------|
| Gloss Level 1 – Matte finish      | Max. 5                | Max. 10               |
| Gloss Level 2 – Velvet finish     | Max.10                | 10 to 35              |
| Gloss Level 3 – Eggshell finish   | 10 to 25              | 10 to 35              |
| Gloss Level 4 – Satin finish      | 20 to 35              | min. 35               |
| Gloss Level 5 – Semi gloss finish | 35 to 70              |                       |
| Gloss Level 6 – Gloss finish      | 70 to 85              |                       |
| Gloss Level 7 – High gloss finish | More than 85          |                       |

- .2 Gloss level ratings of painted surfaces as indicated and as noted on Finish Schedule.

## 2.5 EXTERIOR PAINTING

- .1 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.), sprayed.
  - .1 1 coat of primer, applied in workshop.

- .2 2 coats of finish produced in alkyd design, gloss finish of 7, metallic color such as the roof cover or metallic color such as the outside wall facing. Color choice made by the architect.

## 2.6 EXTERIOR RE-PAINTING

- .1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
  - .1 REX 5.1D - Alkyd gloss level as existing work.
  - .2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
    - .1 REX 5.3B - Alkyd gloss level as existing work.

## 2.7 INTERIOR PAINTING

- .1 Concrete horizontal surfaces:
  - .1 Sealing damp-proofing with silane, in compliance with the legislation on the COV for the concrete(watertight) structures and in masonry..
    - .1 Apply the coat of saturation in two passages, the second pass perpendicular in the still wet coat. The consumption can not be superior to 4,4 m2 / L to obtain the wanted effect. Apply to concrete of 14 days old; or according to the recommendations of the manufacturer.
    - .2 By an optimal performance, cover the entire surface correctly.
- .2 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
  - .1 INT 5.1E Alkyd –gloss finish level 7
- .3 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
  - .1 1 primer coat
  - .2 2 finishing coat, INT 5.3C - Alkyd gloss finish level 7 finish (over cementitious primer).
- .4 Ceiling, steel structure
  - .1 1 coat layer of primer for metal, according to the recommendations of the manufacturer.
  - .2 2 coats of finish of paint in the latex to be vaporized in the dry fallout for interior ceilings.
- .5 Concrete masonry elements: bricks and blocks with smooth face or with fragmented face.
  - .1 1 coat of primer
  - .2 2 coats of finish, INT 4.2A - Produced in the latex, gloss finish level 5<
- .6 Plaster and plasterboards - wall coverings in plasterboards, panels \* Sheetrock +, dry partitions, etc.

- .1 For walls in panels of gypsum or in plaster:
  - .1 A primer coat in latex, in compliance with the standard GS-11 of Green Seal, with = 50 g/L of COV, as well as in compliance with the standard ONGC 1GP-119 and MPI / MPDA category \* 50.
  - .2 Two coats of finish in the acrylic 100% latex egg shell finished, in compliance with the standard GS-11 of Green Seal, without COV, as well as in compliance with the standard ONGC 1GP-209 and MPI / MPDA category \* 144.
- .7 For gypsum board ceilings :
  - .1 A primer coat in latex, in compliance with the standard GS-11 of Green Seal, with = 50 g/L of COV, as well as in compliance with the standard ONGC 1GP-119 and MPI / MPDA category \* 50.
  - .1 Two coats of finish in the acrylic 100% latex egg shell finished, in compliance with the standard GS-11 of Green Seal, without COV, as well as in compliance with the standard ONGC 1GP-100 and MPI / MPDA category \* 143

## **2.8 INTERIOR RE-PAINTING**

- .1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
  - .1 RIN 5.1E - Alkyd as existing work.
- .2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
  - .1 RIN 5.3C - Alkyd as existing work.
- .3 Plaster and Gypsum Board: gypsum wallboard, drywall, "sheet rock" type material, etc.
  - .1 RIN 9.2A - Latex as existing work.
  - .2 RIN 9.2C - Alkyd as existing work.

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual except where specified otherwise.

### 3.2 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

### 3.3 PREPARATION

- .1 Protection of in-place conditions:
  - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Consultant.
  - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
  - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
  - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
  - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
  - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Consultant.
  - .4 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.
  - .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
  - .6 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
    - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
    - .2 Apply wood filler to nail holes and cracks.
    - .3 Tint filler to match stains for stained woodwork.
  - .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.



- .8 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.
- .9 Touch up of shop primers with primer as specified.

### **3.4 APPLICATION**

- .1 Paint only after prepared surfaces have been accepted by Consultant, unless opposite indications, apply the product according to the instructions of the manufacturer.
- .2 Apply coats of paint in continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .3 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .4 Sand and dust between coats to remove visible defects.
- .5 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .6 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .7 Finish closets and alcoves as specified for adjoining rooms.
- .8 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

### **3.5 MECHANICAL/ELECTRICAL EQUIPMENT**

- .1 Paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, to match adjacent surfaces, except as indicated.
- .2 Do not paint over nameplates.
- .3 Keep sprinkler heads free of paint.
- .4 Paint fire protection piping red.
- .5 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .6 Paint natural gas piping yellow.

- .7 Paint both sides and edges of backboards for telephone and electrical equipment before installation.
- .1 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

**END OF SECTION**

## **1 GENERAL**

### **1.01 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Shop drawings to show:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
  - .1 Detailed drawings of bases, supports, and anchor bolts.
  - .2 Acoustical sound power data, where applicable.
  - .3 Points of operation on performance curves.
  - .4 Manufacturer to certify current model production.
  - .5 Certification of compliance to applicable codes.
- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
  - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3 Operation data to include:
    - .1 Control schematics for systems including environmental controls.
    - .2 Description of systems and their controls.
    - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4 Operation instruction for systems and component.
    - .5 Description of actions to be taken in event of equipment failure.
    - .6 Valves schedule and flow diagram.
    - .7 Colour coding chart.
  - .4 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .5 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
    - .3 Special performance data as specified.

- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

## **1.02 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.03 MAINTENANCE**

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
  - .1 One set of packing for each pump.
  - .2 One casing joint gasket for each size pump.
  - .3 One glass for each gauge glass.

- .4 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

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

### **2 PRODUCTS**

#### **2.01 MATERIALS**

- .1 Not Used.

### **3 EXECUTION**

#### **3.01 PAINTING REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

#### **3.02 CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

#### **3.03 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.04 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Oil Pump Systems.
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative will record these demonstrations on video tape for future reference.

### **3.05 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

## **1 GENERAL**

### **1.01 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Shop drawings to show:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
  - .1 Detailed drawings of bases, supports, and anchor bolts.
  - .2 Acoustical sound power data, where applicable.
  - .3 Points of operation on performance curves.
  - .4 Manufacturer to certify current model production.
  - .5 Certification of compliance to applicable codes.
- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
  - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3 Operation data to include:
    - .1 Control schematics for systems including environmental controls.
    - .2 Description of systems and their controls.
    - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4 Operation instruction for systems and component.
    - .5 Description of actions to be taken in event of equipment failure.
    - .6 Valves schedule and flow diagram.
    - .7 Colour coding chart.
  - .4 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .5 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
    - .3 Special performance data as specified.

- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-Built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

## **1.02 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.03 DEVIS DE PERFORMANCE**

- .1 This Section shall be considered a performance specification regarding the following :
  - .1 Calculations and design of protection systems against fire. It is obligatory to appoint an engineer for these purposes. Refer to the section « Services of an engineer ».



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#### 1.04 QUALIFIED SERVICE ENGINEER

- .1 Retain the services of an engineer and the mandate to :
  - .1 Oversee dynamic tests on the water source and the network building and to be present at these tests. Refer to the article « Dynamic tests on the water source and network building ».
  - .2 Make calculations and the complete design of fire protection systems in accordance with all requirements of this Division.
  - .3 Produce detailed plans and specifications, complete and final to be used in the construction based on the simplified Engineer plans. See « Interpreting protection plans against fire Engineer » for guidelines on the interpretation of these simplified plans.
  - .4 Produce, assemble and provide shop drawings, specifications and other documents relating to the calculation, design and products and in accordance with the specific requirements of Sections of this Division.
  - .5 Conduct periodic visits as often as necessary to check :
    - .1 The quality of the implementation.
    - .2 Facility compliance against the plans and specifications for construction, hydraulic calculations and subject sheets.
    - .3 Compliance with regulations, codes and standards.
    - .4 Compliance with the requirements of jurisdictional authorities.
  - .6 Oversee quality control on site and be present during these activities. Refer to the article « Quality Control in place ».
  - .7 Produce and sign a certificate of compliance.
    - .1 Refer to the Section « Elements for submission to completion ».
- .2 Qualifications
  - .1 Engineer, hereinafter called the « Qualified Engineer » must be a member of the OIQ specialized and recognized in the field of fire protection. He must be familiar with codes, standards, and regulations referenced in this Section.
  - .2 Provide resumes of qualified Engineer.

## **2 PRODUCTS**

### **2.01 NOT USED**

## **3 EXECUTION**

### **3.01 PAINTING REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

### **3.02 CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

### **3.03 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

### **3.04 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Fire Alarm.
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative will record these demonstrations on video tape for future reference.

### **3.05 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCES**

- .1 National Fire Prevention Association (NFPA)
  - .1 NFPA 13-2007, Standard for the Installation of Sprinkler Systems.
- .2 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN4 S543-M984, Standard for Internal Lug Quick Connect Couplings for Fire Hose.

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets, 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 Canada.
  - .2 Indicate:
    - .1 Materials.
    - .2 Finishes.
    - .3 Method of anchorage
    - .4 Number of anchors.
    - .5 Supports.
    - .6 Reinforcement.
    - .7 Assembly details.
    - .8 Accessories.
- .4 Samples:
  - .1 Submit samples of following:
    - .1 Each type of sprinkler head.
- .5 Test reports:
  - .1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturers' Instructions:
  - .1 Provide manufacturer's installation instructions.
- .8 Field Quality Control Submittals:
  - .1 Manufacturer's Field Reports: manufacturer's field reports specified.

### **1.03 CLOSEOUT SUBMITTALS**

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 20.
- .2 Manufacturer's Catalog Data, including specific model, type, and size for:
  - .1 Pipe and fittings.
  - .2 Sprinkler heads.
- .2 Records:
  - .1 As-built drawings of each system.
    - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
    - .2 Submit 760 mm by 1050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.
- .3 Operation and Maintenance Manuals:
  - .1 Provide summary sheet, and Contractors Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA 13.

### **1.04 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in wet sprinkler systems with documented experience.
- .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

### **1.05 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Storage and Protection:
  - .1 Store materials indoors in dry location.
  - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

## **2 PRODUCTS**

### **2.01 DESIGN REQUIREMENTS**

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and

advisory provisions of NFPA 13, by pipe schedules for ordinary.

- .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .4 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .5 Design systems for earthquake protection for buildings in seismic zones 3 and 4, and only essential and high risk buildings in seismic zone 2.
- .6 Location of Sprinkler Heads:
  - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.
  - .2 Uniformly space sprinklers on branch.

## **2.02 ABOVE GROUND PIPING SYSTEMS**

- .1 Provide fittings for changes in direction of piping and for connections.
  - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
- .2 Perform welding in shop; field welding will not be permitted.

## **2.03 PIPE, FITTINGS AND VALVES**

- .1 Pipe:
  - .1 Ferrous: to NFPA 13.
  - .2 Copper tube: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
  - .1 Ferrous: screwed, welded, flanged or roll grooved.
    - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
  - .2 Fittings: ULC approved for use in wet pipe sprinkler systems.
  - .3 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
  - .4 Sprinkler pipe and fittings: metal.
- .3 Pipe hangers:
  - .1 ULC listed for fire protection services in accordance with NFPA.

## **2.04 SPRINKLER HEADS**

- .1 General: to NFPA 13 and ULC listed for fire services.

- .2 Sprinkler Head Type:
  - .1 Type A: upright bronze.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
  - .1 Release element of each head to be of temperature, as suitable for specific application.
  - .2 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
  - .3 Deflector: not more than 75 mm below suspended ceilings.
  - .4 Ceiling plates: not more than 25 mm deep.
  - .5 Ceiling cups: not permitted.

## **2.05 PIPE SLEEVES**

- .1 Provide pipe sleeves where piping passes through walls.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of walls.
- .4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
  - .1 Firmly pack space with mineral wool insulation.
  - .2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal.
  - .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
- .5 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:
  - .1 Provide 0.61 mm thick galvanized steel sheet.

## **2.06 ESCUTCHEON PLATES**

- .1 Provide one piece type metal plates for piping passing through walls in exposed spaces.
- .2 Provide polished stainless steel plates in finished spaces.
- .3 Provide paint finish on metal plates in unfinished spaces.

## **3 EXECUTION**

### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

### **3.02 INSTALLATION**

- .1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

### 3.03 PIPE INSTALLATION

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.

### 3.04 DISINFECTION

- .1 Disinfect new piping and existing piping.
- .2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.
- .3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.
- .4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

### 3.05 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
  - .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.
  - .2 Test, inspect, and approve piping before covering or concealing.
  - .3 Preliminary Tests:
    - .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
    - .2 Flush piping with potable water in accordance with NFPA 13.
    - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
    - .4 Test alarms and other devices.
    - .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
  - .4 Formal Tests and Inspections:
    - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
    - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
    - .3 Repeat required tests as directed.
    - .4 Correct defects and make additional tests until systems comply with contract requirements.

- .5 Furnish appliances, connecting devices, and personnel for tests.
  - .6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.
- .2 Manufacturer's Field Services:
- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

**END OF SECTION**



## **1 GENERAL**

### **1.01 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Shop drawings to show:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
  - .1 Detailed drawings of bases, supports, and anchor bolts.
  - .2 Acoustical sound power data, where applicable.
  - .3 Points of operation on performance curves.
  - .4 Manufacturer to certify current model production.
  - .5 Certification of compliance to applicable codes.
- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
  - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3 Operation data to include:
    - .1 Control schematics for systems including environmental controls.
    - .2 Description of systems and their controls.
    - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4 Operation instruction for systems and component.
    - .5 Description of actions to be taken in event of equipment failure.
    - .6 Valves schedule and flow diagram.
    - .7 Colour coding chart.
  - .4 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .5 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
    - .3 Special performance data as specified.

- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 The Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur..
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

## **1.02 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.03 TRANSPORT, STORAGE, HANDLING**

- .1 Waste disposal and management.

**2 PRODUCTS**

**2.01 NOT USED**

**3 EXECUTION**

**3.01 PAINTING REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.02 CLEANING**

- .1 Clean interior and exterior of all systems. Vacuum interior of ductwork and air handling units.

**3.03 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

**3.04 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
  - .1 ASHRAE 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).
- .2 Electrical Equipment Manufacturers' Association Council (EEMAC)
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Shop Drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec.
- .3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
    - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.
- .4 Closeout Submittals
  - .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.03 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

### **1.04 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

## **2 PRODUCTS**

### **2.01 GENERAL**

- .1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

### **2.02 MOTORS**

- .1 Provide motors for mechanical equipment as specified.
- .2 Motors under 1/2 HP: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

## **3 EXECUTION**

### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

### **3.02 INSTALLATION**

- .1 Fasten securely in place.
- .2 Make removable for servicing, easily returned into, and positively in position.

### **3.03 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests [in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .3 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:

- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Resource reuse.
- .5 Recycled content.
- .6 Local/regional materials.
- .7 Certified wood.
- .8 Low-emitting materials.

#### **3.04 CLEANING**

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

**END OF SECTION**





## **1 GENERAL**

### **1.01 SUMMARY**

- .1 Vibration isolation materials and components, seismic control measures and their installation.

### **1.02 REFERENCES**

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .2 National Fire Protection Association (NFPA)
  - .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.
- .3 National Building Code of Canada (NBC) – 2005.
- .4 CSA S832-06
  - .1 Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    - .1 Submit [two] copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Provide system shop drawings complete with performance and product data.
  - .3 Provide detailed drawings of seismic control measures for equipment and piping.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

### **1.04 QUALITY ASSURANCE**

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

## **2 PRODUCTS**

### **2.01 GENERAL**

- .1 Size and shape of bases type and performance of vibration isolation as indicated.

### **2.02 ELASTOMERIC PADS**

- .1 Type EP1 - neoprene waffle or ribbed; 9 mm minimum thick; 50 durometer; maximum loading 350 kPa.
- .2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.
- .3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.
- .4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

### **2.03 ELASTOMERIC MOUNTS**

- .1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

### **2.04 SPRINGS**

- .1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.
- .2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.
- .3 Cadmium plate for outdoor installations.
- .4 Colour code springs.

## **2.05 SPRING MOUNT**

- .1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.
- .2 Type M2 - stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.
- .3 Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.
- .4 Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.
- .5 Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg maximum.
- .6 Performance: as indicated.

## **2.06 HANGERS**

- .1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal to metal contact.
- .2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.
- .3 Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.
- .4 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.
- .5 Type H4 - stable spring, elastomeric element with precompression washer and nut.
- .6 Performance: as indicated.

## **2.07 HORIZONTAL THRUST RESTRAINT**

- .1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.
- .2 Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

## 2.08 STRUCTURAL BASES

- .1 Type B1 - Prefabricated steel base: integrally welded on sizes up to 2400 mm on smallest dimension, split for field welding on sizes over 2400 mm on smallest dimension and reinforced for alignment of drive and driven equipment; without supplementary hold down devices; complete with isolation element attached to base brackets arranged to minimize height; pre-drilled holes to receive equipment anchor bolts; and complete with adjustable built-in motor slide rail where indicated.
- .2 Type B2 - Steel rail base: structural steel, positioned for alignment of drive and driven equipment; without supplementary hold down devices; complete with isolation element attached to base brackets arranged to minimize height; and pre-drilled holes to receive equipment anchor bolts.
- .3 Bases to clear housekeeping pads by 25 mm minimum.

## 2.09 SEISMIC CONTROL MEASURES

- .1 General:
  - .1 Following systems and/or equipment to remain operational during and after earthquakes:
    - .1 Exhaust fan.
  - .2 Seismic control systems to work in every direction.
  - .3 Fasteners and attachment points to resist same maximum load as seismic restraint.
  - .4 Drilled or power driven anchors and fasteners not permitted.
  - .5 No equipment, equipment supports or mounts to fail before failure of structure.
  - .6 Supports of cast iron or threaded pipe not permitted.
  - .7 Seismic control measures not to interfere with integrity of firestopping.
- .2 Static equipment:
  - .1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
  - .2 Suspended equipment:
    - .1 Use one or more of following methods depending upon site conditions and or [as indicated:
      - .1 Install tight to structure.
      - .2 Cross brace in every direction.
      - .3 Brace back to structure.
      - .4 Cable restraint system.
  - .3 Seismic restraints:
    - .1 Cushioning action gentle and steady.
    - .2 Never reach metal-like stiffness.
- .3 Vibration isolated equipment:
  - .1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.
  - .2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.
  - .3 As indicated.

- .4 Piping systems:
  - .1 Fire protection systems: to NFPA 13.
  - .2 Piping systems: hangers longer than 300 mm; brace at each hanger.
  - .3 Compatible with requirements for anchoring and guiding of piping systems.
- .5 Bracing methods:
  - .1 Approved by Departmental Representative.
  - .2 Structural angles or channels.
  - .3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

### **3 EXECUTION**

#### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

#### **3.02 INSTALLATION**

- .1 Seismic control measures to meet requirements of NBC.
- .2 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.
- .3 Ensure ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
- .4 Where isolation is bolted to floor use vibration isolation rubber washers.
- .5 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

#### **3.03 FIELD QUALITY CONTROL**

- .1 Inspection and Certification:
  - .1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .2 Provide Departmental Representative with notice 72 h in advance of commencement of tests.
  - .3 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).

- .4 Submit complete report of test results.

### **3.04 CLEANING**

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

**END OF SECTION**

## **1 GENERAL**

### **1.01 SUMMARY**

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

### **1.02 QUALIFICATIONS OF TAB PERSONNEL**

- .1 Submit names of personnel to perform TAB to Departmental Representative within 30 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
  - .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.
  - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
  - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
  - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
  - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

### **1.03 PURPOSE OF TAB**

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

### **1.04 EXCEPTIONS**

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

### **1.05 CO-ORDINATION**

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

### **1.06 PRE-TAB REVIEW**

- .1 Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

### **1.07 START-UP**

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

### **1.08 OPERATION OF SYSTEMS DURING TAB**

- .1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.



#### **1.09 START OF TAB**

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, and caulking.
- .5 Pressure, leakage, other tests specified elsewhere Division 23.
- .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .1 Proper thermal overload protection in place for electrical equipment.
  - .2 Air systems:
    - .1 Filters in place, clean.
    - .2 Duct systems clean.
    - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
    - .4 Correct fan rotation.
    - .5 Fire, smoke, volume control dampers installed and open.

#### **1.10 APPLICATION TOLERANCES**

- .1 Do TAB to following tolerances of design values:
  - .1 HVAC systems: plus 10 %, minus 0 %.

#### **1.11 ACCURACY TOLERANCES**

- .1 Measured values accurate to within plus or minus 2 % of actual values.

#### **1.12 INSTRUMENTS**

- .1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

#### **1.13 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

#### **1.14 PRELIMINARY TAB REPORT**

- .1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
  - .1 Details of instruments used.
  - .2 Details of TAB procedures employed.
  - .3 Calculations procedures.
  - .4 Summaries.

#### **1.15 TAB REPORT**

- .1 Format in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
  - .1 Project record drawings.
  - .2 System schematics.
- .3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in both official languages in D-ring binders, complete with index tabs.

#### **1.16 VERIFICATION**

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide personnel and instrumentation to verify up to 30 % of reported results.
- .3 Number and location of verified results as directed by Departmental Representative.
- .4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

#### **1.17 SETTINGS**

- .1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

#### **1.18 COMPLETION OF TAB**

- .1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

#### **1.19 AIR SYSTEMS**

- .1 Standard: TAB to most stringent of this section or TAB standards of AABC, NEBB, SMACNA, ASHRAE.
- .2 Do TAB of systems, equipment, components, controls specified Division 23.

- .3 Qualifications: personnel performing TAB qualified to standards of AABC or NEBB.
- .4 Quality assurance: perform TAB under qualified direction supervisor, to standards of AABC or NEBB.
- .5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: to include as appropriate:
  - .1 Inlet and outlet of dampers, fan, other equipment causing changes in conditions.
  - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

#### **1.20 OTHER TAB REQUIREMENTS**

- .1 General requirements applicable to work specified this paragraph:
  - .1 Qualifications of TAB personnel: as for air systems specified this section.
  - .2 Quality assurance: as for air systems specified this section.

## **2 PRODUCTS**

### **2.01 NOT USED**

## **3 EXECUTION**

### **3.01 NOT USED**

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

### **1.02 REFERENCES**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ANSI/ASHRAE/IESNA 90.1-01, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM B 209M-02, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
  - .2 ASTM C 335-95, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
  - .3 ASTM C 411-97, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .4 ASTM C 449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .5 ASTM C 547-00, Specification for Mineral Fiber Pipe Insulation.
  - .6 ASTM C 553-00, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .7 ASTM C 612-00a, Specification for Mineral Fiber Block and Board Thermal Insulation.
  - .8 ASTM C 795-92, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
  - .9 ASTM C 921-92(1998)e1, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- .3 Canadian General Standards Board (CGSB)
  - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).
- .5 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-M88(R2000), Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S701-01, Thermal Insulation Polyotrene, Boards and Pipe Covering.

### **1.03 DEFINITIONS**

- .1 For purposes of this section:

- .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
  - .2 "EXPOSED" - will mean "not concealed" as defined herein.
  - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
    - .1 CRD: Code Round Ductwork,
    - .2 CRF: Code Rectangular Finish.

#### **1.04 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

#### **1.05 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

#### **1.06 MANUFACTURERS' INSTRUCTIONS**

- .1 Submit manufacturer's installation instructions in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Installation instructions to include procedures used, and installation standards achieved.

#### **1.07 QUALIFICATIONS**

- .1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, qualified to standards member of TIAC.

#### **1.08 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Protect from weather and construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions recommended by manufacturer.

## **2 PRODUCTS**

### **2.01 FIRE AND SMOKE RATING**

- .1 In accordance with CAN/ULC-S102:
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

### **2.02 INSULATION**

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24° C mean temperature when tested in accordance with ASTM C 335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C 612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C 553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
  - .1 Mineral fibre: to ASTM C 553.
  - .2 Jacket: to CGSB 51-GP-52Ma.
  - .3 Maximum "k" factor: to ASTM C 553.

### **2.03 JACKETS**

- .1 Canvas:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
- .2 Lagging adhesive: Compatible with insulation.

### **2.04 ACCESSORIES**

- .1 Vapour retarder lap adhesive:
  - .1 Water based, fire retardant type, compatible with insulation.
- .2 Indoor Vapour Retarder Finish:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449.
- .4 ULC Listed Canvas Jacket:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

- .5 Outdoor Vapour Retarder Mastic:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
  - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².
- .6 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.
- .7 Contact adhesive: quick-setting
- .8 Canvas adhesive: washable.
- .9 Tie wire: 1.5 mm stainless steel.
- .10 Fasteners: 2 or 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

### **3 EXECUTION**

#### **3.01 PRE-INSTALLATION REQUIREMENTS**

- .1 Pressure testing of ductwork systems complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

#### **3.02 INSTALLATION**

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and as indicated.
- .3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Hangers, supports to be outside vapour retarder jacket.
- .5 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.

#### **3.03 DUCTWORK INSULATION SCHEDULE**

- .1 Insulation types and thicknesses: conform to following table:
- .2 HERE Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:
  - .1 Use TIAC code C-1 insulation, scored to suit diameter of duct.



- .1 Finishes: Conform to following table:

|   | TIAC Code   |       |
|---|-------------|-------|
|   | Rectangular | Round |
| Indoor,<br>concealed                            | none        | none  |
| Indoor,<br>exposed within<br>mechanical<br>room | CRF/1       | CRD/2 |
| Indoor,<br>exposed<br>elsewhere                 | CRF/2       | CRD/3 |

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
    - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

### **1.03 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

### **1.04 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

### **1.05 PERFORMANCE REQUIREMENTS**

- .1 Perform design, installation, programming and commissioning of new components of building automation. Connect to existing systems manufacturer Delta.
- .2 Supply and install all equipment and accessories specified and required to make a complete and operational integrated automation system.

- .1 Description of integrated automation systems in the quote and charts plans to achieve defined outcomes. All equipment and accessories necessary for a complete job are not necessarily listed or shown. Supply and install all equipment and accessories required so that the system operation is consistent with the sequence of operations described in the plans and specifications.
- .2 The location of the equipment shown on plans are approximate and should be checked on site before commencing work.
- .3 Interface language
  - .1 Design system to allow to operator to use the language of their choice (French or English).
  - .2 Use symbols for graphics.
  - .3 All documentation must be in French and English.
  - .4 All messages, commands and alarms are displayed on the screen or the printer in the language chosen by the operator.

## **2 PRODUCTS**

### **2.01 CONTROL**

- .1 All work and components must be compliant and compatible with this existing network from Delta manufacturer.
- .2 The main connection to existing automatic control of the complex and / or facility via a manufacturer-authorized installer and / or the new control facility will be 100% compatible with the existing control system without system medium by various data translation.
- .3 See components description in section 25 30 02 - EMCS: Field control devices.

## **3 EXECUTION**

### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

### **3.02 INSTALLATION**

- .1 Install control devices.
- .2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.

### **3.03 CLEANING**

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

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

**END OF SECTION**



## **1 GENERAL**

### **1.01 SUMMARY**

- .1 Wall exhausters.

### **1.02 REFERENCES**

- .1 Air Movement and Control Association (AMCA)
  - .1 AMCA Publication 99-2003, Standards Handbook (Revised 2003).
  - .2 AMCA 300-1996, Reverberant Room Method for Sound Testing of Fans.
  - .3 AMCA 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .2 American National Standards Institute (ANSI)
  - .1 ANSI/AMCA 210-99, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

### **1.03 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force. Provide confirmation of testing.
  - .2 Capacity: flow rate, static pressure Pa, r/min, bhp W, model and size and sound ratings as indicated on schedule.
- .2 Statically and dynamically balanced. Constructed to AMCA 99.
- .3 Sound ratings: comply with AMCA 301, tested to AMCA 300. Unit shall bear AMCA certified sound rating seal.
- .4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, unit to bear AMCA certified rating seal.
- .5 Bearings: sealed lifetime heavy duty grease lubricated ball or roller bearings of self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 100,000 hours.

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Include :
    - .1 Fan performance curves showing specified point of operation.
    - .2 Sound rating data.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
    - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.
- .4 Closeout Submittals
  - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

#### **1.05 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

#### **1.07 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
  - .1 Bearings and seals.
  - .2 Addresses of suppliers.
  - .3 List of specialized tools necessary for adjusting, repairing or replacing.



## **2 PRODUCTS**

### **2.01 SUSTAINABLE REQUIREMENTS**

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

### **2.02 WALL EXHAUSTERS**

- .1 Centrifugal backward inclined or Axial fan units, direct driven.
  - .1 Spun aluminum, complete with resilient mounted motor and fan.
  - .2 12 mm mesh 2.0 mm diameter aluminum birdscreen.
  - .3 Automatic gasketed aluminum backdraft dampers.
  - .4 Disconnect switch within fan housing.
  - .5 Cadmium plated stainless steel securing bolts and screws.
- .2 Housings:
  - .1 Provide with rubber or neoprene grommets for wiring passages, integral attachment collar, or angle ring mounted to mating flanged wall sleeve with full gasketting.
  - .2 Discharge pattern: away from building.

## **3 EXECUTION**

### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

### **3.02 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.

### **3.03 ANCHOR BOLTS AND TEMPLATES**

- .1 Size anchor bolts to withstand seismic acceleration and velocity forces as specified in section.

### **3.04 FIELD QUALITY CONTROL**

- .1 Verification requirements include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Low-emitting materials.

**3.05 CLEANING**

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

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCES**

- .1 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)
  - .1 ANSI/NFPA 96-04, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM E 90-04, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- .5 Society of Automotive Engineers (SAE)

### **1.03 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria and limitations.
    - .1 Submit two (2) copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Indicate following:
    - .1 Pressure drop.
    - .2 Face area.
    - .3 Free area.

- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
    - .1 Departmental Representative will make available one (1) copy of systems supplier's installation instructions.
- .3 Test Reports:
  - .1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E 90.

#### **1.05 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

### **2 PRODUCTS**

#### **2.01 FIXED LOUVRES - ALUMINUM**

- .1 Construction: welded with exposed joints ground flush and smooth.
- .2 Material: extruded aluminum alloy 6063-T5.
- .3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm.
- .4 Frame, head, sill and jamb: 100 mm deep onwe piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.
- .5 Mullions: at 1500 mm maximum centres.

- .6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
- .7 Screen: 12 mm exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.
- .8 Finish: factory applied enamel, anodized colour: to Departmental Representative Representative's approval.

### **3 EXECUTION**

#### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

#### **3.02 INSTALLATION**

- .1 In accordance with manufacturer's and SMACNA recommendations.
- .2 Reinforce and brace as indicated.
- .3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

#### **3.03 CLEANING**

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

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.46-M1988, Electric Air-Heaters.
- .2 Underwriters' Laboratories (UL) Inc.
  - .1 UL 1042-1994, Electric Baseboard Heating Equipment.

### **1.02 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data sheets for baseboard convectors. Include:
  - .1 Product characteristics.
  - .2 Performance criteria.
  - .3 Mounting methods.
  - .4 Physical size.
  - .5 kW rating, voltage, phase.
  - .6 Cabinet material thicknesses.
  - .7 Limitations.
  - .8 Colour and finish.

### **1.03 CLOSEOUT SUBMITTALS**

- .1 Submit operation and maintenance data for baseboard convectors in accordance with Section 01 78 00 - Closeout Submittals.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with Waste Reduction Workplan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Collect, package and store existing convectors units for either reuse or recycling and return to recycler in accordance with Waste Management Plan.

## **2 PRODUCTS**

### **2.01 MANUFACTURERS**

- .1 Acceptable products:
  - .1 Ouellet, Stelpro or equivalent.

### **2.02 BASEBOARD CONVECTORS**

- .1 Heaters: to CSA C22.2 No.46, UL 1042 wattage density as indicated with connection box both ends.
  - .1 Element through-type fitted with aluminum convector vanes and resistor wire enclosed in mineral insulation in aluminum sheath.
- .2 Element: locked to cabinet and supported at additional points throughout length to allow for linear expansion with non metallic supports.
- .3 Cabinet: to CSA C22.2 No.46, UL 1042, pre-drilled back for securing to wall. Integral air diffusion reflector with wireway at bottom.
  - .1 Front inlet/front outlet.
  - .2 Panel: steel, metal thickness, bottom 1 mm, front 1.6 mm thick.
  - .3 Finish: phosphatized and finished with 2 coats air-dry white colour.

### **2.03 CONTROLS**

- .1 Wall mounted thermostats: type low voltage, to Section 23 09 33 - Electric and Electronic Control System for HVAC.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install baseboard convector heaters, blank sections and controls.
- .2 When wireway is used, remove knock-outs and insert insulating bushing between units.
- .3 Install grounding wire to maintain ground integrity between heating, blank, and auxiliary sections.
- .4 Install thermostats in locations indicated.
- .5 Make power and control connections.

### **3.02 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Ensure heaters and controls operate correctly.

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.46-M1988, Electric Air-Heaters.

### **1.02 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data sheets for unit heaters. Include:
  - .1 Product characteristics.
  - .2 Performance criteria.
  - .3 Mounting methods.
  - .4 Physical size.
  - .5 kW rating, voltage, phase.
  - .6 Cabinet material thicknesses.
  - .7 Limitations.
  - .8 Colour and finish.

### **1.03 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for unit heaters for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with Waste Reduction Workplan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Collect, package and store existing unit heaters for either reuse, recycling or rebuilding and return to recycler in accordance with Waste Management Plan.

## **2 PRODUCTS**

### **2.01 MANUFACTURERS**

- .1 Acceptable manufacturers:
  - .1 Ouellet, Stelpro and approved equivalent.

## **2.02 UNIT HEATERS**

- .1 Unit heater: to CSA C22.2 No.46, vertical discharge.
- .2 Fan type unit heaters with built-in high-heat limit protection, fan-delay switches.
- .3 Fan motor: permanently lubricated ball bearing type with resilient mount.
  - .1 Built-in fan motor thermal overload protection.
- .4 Hangers: as indicated.
- .5 Elements: mineral insulated copper coated steel.
- .6 Cabinet: steel, fitted with 4 brackets for rod.

## **2.03 CONTROLS**

- .1 Wall mounted thermostats: type low voltage, to Section 23 09 33 - Electric and Electronic Control System for HVAC.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Suspend unit heaters from ceiling as indicated.
- .2 Install thermostats in locations indicated.
- .3 Make power and control connections.

### **3.02 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Test cut-out protection when air movement is obstructed.
- .3 Test fan delay switch to assure dissipation of heat after element shut down.
- .4 Test unit cut-off when fan motor overload protection has operated.
- .5 Ensure heaters and controls operate correctly.

**END OF SECTION**

## **1 GENERAL**

### **1.01 SUMMARY**

- .1 Control devices integral to the Building Energy Monitoring and Control System (EMCS).

### **1.02 REFERENCES**

- .1 American National Standards Institute (ANSI).
  - .1 ANSI C12.7-1993(R1999), Requirements for Watthour Meter Sockets.
  - .2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.
- .2 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM B 148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.
- .3 National Electrical Manufacturer's Association (NEMA).
  - .1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).
- .4 Air Movement and Control Association, Inc. (AMCA).
  - .1 AMCA Standard 500-D-98, Laboratory Method of Testing Dampers For Rating.
- .5 Canadian Standards Association (CSA International).
  - .1 CSA-C22.1-02, Canadian Electrical Code, Part 1 (19th Edition), Safety Standard for Electrical Installations.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings and manufacturer's installation instructions.
- .2 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions for specified equipment and devices.

## **2 PRODUCTS**

### **2.01 GENERAL**

- .1 Control devices of each category to be of same type and manufacturer.
- .2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight.
- .3 Operating conditions: 0 - 32 degrees C with 10 - 90% RH (non-condensing) unless otherwise specified.
- .4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.
- .5 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.

- .6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .7 Outdoor installations: use weatherproof construction in NEMA 4 enclosures.
- .8 Devices installed in user occupied space not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

## 2.02 TEMPERATURE SENSORS

- .1 Room temperature sensors and display wall modules.
  - .1 Room temperature sensors.
    - .1 Wall mounting, in slotted type covers having brushed stainless steel finish, with guard as indicated.
    - .2 Element 10-50 mm long RTD with ceramic tube or equivalent protection or thermistor, 10,000 ohm, accuracy of plus or minus 0.2 degrees C.

## 2.03 TEMPERATURE TRANSMITTERS

- .1 Requirements:
  - .1 Input circuit: to accept 3-lead, 100 or 1000 ohm at 0 degrees C, platinum resistance detector type sensors.
  - .2 Power supply: 24 V DC into load of 575 ohms. Power supply effect less than 0.01 degrees C per volt change.
  - .3 Output signal: 4 - 20 mA into 500 ohm maximum load.
  - .4 Input and output short circuit and open circuit protection.
  - .5 Output variation: less than 0.2 % of full scale for supply voltage variation of plus or minus 10 %.
  - .6 Combined non-linearity, repeatability, hysteresis effects: not to exceed plus or minus 0.5 % of full scale output.
  - .7 Maximum current to 100 or 1000 ohm RTD sensor: not to exceed 25 mA.
  - .8 Integral zero and span adjustments.
  - .9 Temperature effects: not to exceed plus or minus 1.0 % of full scale/ 50 degrees C.
  - .10 Long term output drift: not to exceed 0.25 % of full scale/ 6 months.
  - .11 Transmitter ranges: select narrowest range to suit application from following:
    - .1 Minus 50 degrees C to plus 50 degrees C, plus or minus 0.5 degrees C.
    - .2 0 to 100 degrees C, plus or minus 0.5 degrees C.
    - .3 0 to 50 degrees C, plus or minus 0.25 degrees C.
    - .4 0 to 25 degrees C, plus or minus 0.1 degrees C.
    - .5 10 to 35 degrees C, plus or minus 0.25 degrees C.

## 2.04 ELECTROMECHANICAL RELAYS

- .1 Requirements:
  - .1 Double voltage, DPDT, plug-in type with termination base.
  - .2 Coils: rated for 120V AC or 24V DC. Other voltage: provide transformer.
  - .3 Contacts: rated at 5 amps at 120 V AC.
  - .4 Relay to have visual status indication

## 2.05 ELECTRONIC CONTROL DAMPER ACTUATORS

- .1 Requirements:

- .1 Direct mount proportional type as indicated.
- .2 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.
- .3 Operator: size to control dampers against maximum pressure and dynamic closing/opening pressure, whichever is greater.
- .4 Power requirements: 5 VA maximum at 24 V AC.
- .5 Operating range: 0 - 10 V DC or 4 - 20 mA DC.
- .6 Damper actuator to drive damper from full open to full closed in less than 120 seconds.

## **2.06 WIRING**

- .1 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.
- .2 Wiring must be continuous without joints.
- .3 Sizes:
  - .1 Field wiring to digital device: 20AWG stranded twisted pair.
  - .2 Analog input and output: shielded #20 minimum stranded twisted pair.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
- .2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.
- .3 Fire stopping: provide space for fire stopping.
- .4 Electrical:
  - .1 Complete installation in accordance with Section 26 05 00 - Common Work Results - Electrical.
  - .2 Refer to electrical control schematics included as part of control design schematics. Trace existing control wiring installation and provide updated wiring schematics including additions, deletions to control circuits for review by Departmental Representative before beginning Work.
  - .3 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
  - .4 Install communication wiring in conduit.
    - .1 Provide complete conduit system to link Building Controllers, field panels and OWS(s).
    - .2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.
    - .3 Maximum conduit fill not to exceed 40%.
    - .4 Design drawings do not show conduit layout.
  - .5 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise.

### **3.02 TEMPERATURE**

- .1 Stabilize to ensure minimum field adjustments or calibrations.
- .2 Readily accessible and adaptable to each type of application to allow for quick easy replacement and servicing without special tools or skills.

### **3.03 IDENTIFICATION**

- .1 Identify field devices.

### **3.04 TESTING AND COMMISSIONING**

- .1 Calibrate and test field devices for accuracy and performance.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.10.10, Québec Construction Code, Chapter V-Electricity Canadian Electrical Code, Part I (21<sup>st</sup> edition) with Québec Amendments (2010).
  - .2 CSA C22.2 188-M1983 (R1999), Splicing Wire and Cable Connectors.
  - .3 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
  - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 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.

### **1.02 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.

### **1.03 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 and labels for control items in English and French.
- .4 Use one nameplate or label for both languages.

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.
- .3 Submit for review single line electrical diagrams under plexiglass and locate as indicated.
  - .1 Electrical distribution system in main electrical room.
  - .2 Electrical power generation and distribution systems in power plant rooms.

- .4 Shop drawings:
  - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
  - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
  - .3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Quality Control: in accordance with Section 01 45 00 - Quality Control.
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special 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.
  - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
  - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
  - .7 Test reports.

#### **1.05 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.
  - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
  - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.



## **1.07 SYSTEM STARTUP**

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service Departmental Representative to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 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.

## **1.08 OPERATING INSTRUCTIONS**

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

## **2 PRODUCTS**

### **2.01 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

- .3 Factory assemble control panels and component assemblies.

## 2.02 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

## 2.03 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of inspection authorities.
- .2 Porcelain enamel signs, minimum size 175 x 250 mm.
- .3 Danger warning signs required on doors accessing the new electric room in Building #1 basement, access to the electric room in tunnel K6 and on the door of the new exterior cabanon.

## 2.04 WIRING TERMINATIONS

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

## 2.05 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
- .1 Nameplates: lamicoid 3 mm melamine, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
- .2 Sizes as follows:

### NAMEPLATE SIZES

|        |             |         |                    |
|--------|-------------|---------|--------------------|
| Size 1 | 10 x 50 mm  | 1 line  | 3 mm high letters  |
| Size 2 | 12 x 70 mm  | 1 line  | 5 mm high letters  |
| Size 3 | 12 x 70 mm  | 2 lines | 3 mm high letters  |
| Size 4 | 20 x 90 mm  | 1 line  | 8 mm high letters  |
| Size 5 | 20 x 90 mm  | 2 lines | 5 mm high letters  |
| Size 6 | 25 x 100 mm | 1 line  | 12 mm high letters |
| Size 7 | 25 x 100 mm | 2 lines | 6 mm high letters  |

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

## 2.06 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 C22.10.
- .4 Use colour coded wires in communication cables, matched throughout system.

## 2.07 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     |
| up to 5 kV               | Yellow | Blue      |
| up to 15 kV              | Yellow | Red       |
| Telephone                | Green  |           |
| Other                    | Green  | Blue      |
| Communication<br>Systems |        |           |
| Fire Alarm               | Red    |           |

|   |     |        |
|---|-----|--------|
| Emergency<br>Voice<br>Other<br>Security<br><u>Systems</u> | Red | Blue   |
|   | Red | Yellow |

## 2.08 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC 2Y-1.
  - .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

## 3 EXECUTION

### 3.01 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.10 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

### 3.02 NAMEPLATES AND LABELS

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

### 3.03 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.
- .4 Install underground cables in accordance with manufacturer's requirements. Submit to the Departmental Representative a written certification from the cable manufacturer stating that the installation conforms to their requirements prior and after the installation of subgrade and backfill material in each trench (see article 3.07.5).

### 3.04 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between

boxes.

- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.

### **3.05 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400 mm.
  - .2 Wall receptacles:
    - .1 General: 300 mm.
    - .2 Above top of counters or counter splash backs: 175 mm.
    - .3 In mechanical rooms: 1400 mm.
  - .3 Panelboards: as required by Code or as indicated.
  - .4 Telephone and interphone outlets: 300 mm.
  - .5 Wall mounted telephone and interphone outlets: 1500 mm.
  - .6 Fire alarm stations: 1500 mm.
  - .7 Fire alarm bells: 2100 mm.
  - .8 Television outlets: 300 mm.

### **3.06 CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
- .2 Submit to the Departmental Representative an electrical coordination study report for the main electrical distribution (1 200A and above).

### **3.07 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 - SUBMITTALS: phase and neutral currents on panelboards and dry-core transformers, 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 with Section 01 45 00 - Quality Control.
  - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 Systems: fire alarm system communications.
  - .6 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.08 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

**END OF SECTION**

## **1 GENERAL**

### **1.01 WIRE AND BOX CONNECTORS**

- .1 Wire and box connectors, materials and accessories including their installation.

### **1.02 RELATED REQUIREMENTS**

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

### **1.03 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2 No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2 No.65-93(R1999), Wire Connectors.
- .2 National Electrical Manufacturers Association (NEMA)

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Governing Authorities.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Compression type conductor splicing connector in aluminum for single conductors and TECK cables at 1000V to: CSA C22.2 No.65, with current carrying parts of copper sized to conductor or TECK cable caliber and with appropriate insulated 1000V shrink tubing.
- .4 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

- .1 Connector body and stud clamp for stranded, copper, conductors.
  - .2 Clamp for stranded, round, copper, conductors.
  - .3 Stud clamp bolts.
  - .4 Bolts for copper bar.
  - .5 Sized for conductors, bars as indicated.
- .5 Clamps or connectors for armoured cable, flexible conduit as required to: CAN/CSA-C22.2 No.18.

### **3 EXECUTION**

#### **3.01 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors 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 CSA C22.2 No.65.
  - .2 Install fixture type connectors and tighten. Replace insulating cap.
  - .3 Install insulated tubing and compression type connectors; secure connector to conductor with appropriate compression tool as recommended by manufacturer and then overlap insulated shrink tubing over connector. Follow manufacturer's recommendations to render shrink tubing electrically sound in accordance with CSA C22.2 No.65.
  - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

### **1.02 REFERENCES**

- .1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131-M89(R1994), Type TECK 90 Cable.

### **1.03 PRODUCT DATA**

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

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600, 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90, RWU90. Use RWU90 conductors in underground and exterior installations.

### **2.02 COPPER TECK CABLE**

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors:
  - .1 Circuit conductors: copper, size as indicated.
- .3 Insulation:
  - .1 Chemically cross-linked thermosetting polyethylene rated type RW90XLPE, 1000 V.

- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat, interlocking, galvanized steel, aluminum.
- .6 Overall covering: polyvinyl chloride material.
- .7 Fastenings:
  - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two or more cables at 50 mm centers.
  - .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
  - .1 Watertight approved for TECK cable.

#### **2.03 COPPER ALUMINIUM ALLOY TECK CABLE**

- .1 Cable : to CAN/CSA-C22.2 no 131 (TECK).
- .2 Circuit conductors : ACM alloy (NUAL) size as indicated.
- .3 Insulation :
  - .1 Chemically cross-linked thermosetting polyethylene rated type RW90 XLPE, 1 000 V.
- .4 Inner jacket : polyvinyl chloride material.
- .5 Armour : interlocking aluminium.
- .6 Overall covering : polyvinyl chloride material.
- .7 Supports : Utility separators IPEX, model 4X1, base #029572 and intermediate separators #029556 or approved equivalent.
- .8 Connectors :
  - .1 Sealtight for NUAL TECK cables.
- .9 Submit cable ampacity calculations from the manufacturer as well as cable disposition in underground trench.

#### **2.04 ARMOURED CABLES**

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel or aluminum strip.
- .4 Type: ACWU90 - PVC flame retardant jacket over thermoplastic armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2 m.

- .5 Connectors: anti-short-circuit.

## **2.05 CONTROL CABLES**

- .1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket, and armour of closely wound aluminum wire.
- .2 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with polyethylene insulation, and aluminum strip or copper strip.

## **3 EXECUTION**

### **3.01 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.

### **3.02 INSTALLATION OF COPPER TECK CABLE 0 -1000 V**

- .1 Install cables for powering existing services as indicated.
  - .1 Group cables wherever possible on channels and cable trays.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

### **3.03 INSTALLATION OF COPPER ALUMINIUM LAYERS CABLES**

- .1 Install cables in underground trench, as indicated on cable supports.
- .2 Install cable supports centre-centre within a 2 m trench, as indicated.
- .3 Cover cables in prescribed backfill in layers, as indicated.

### **3.04 INSTALLATION OF ARMOURED CABLES**

- .1 Group cables wherever possible.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

### **3.05 INSTALLATION OF CONTROL CABLES**

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
  - .1 ANSI/IEEE 837-1989(R1996), Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International)
- .3 CAN/CSA Z32-1999, Electrical Safety and Essential Electrical Systems in Health Care Facilities.
- .4 CSA C22.2, no 41-M1987 (R2003) Grounding and Bonding Equipment.

### **1.02 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material [in appropriate on-site bins] for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Governing Authorities.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 EQUIPMENT**

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .3 Insulated grounding conductors: green, type RW 90.
- .4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .5 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**

#### **3.01 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, 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 bonding wire for flexible conduit, connected at both end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .7 Ground secondary service pedestals.

#### **3.02 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to neutral of primary 600 V system, secondary 120/208 V system.

#### **3.03 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators and escalators, distribution panels, outdoor lighting.

#### **3.04 GROUNDING BUS**

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0AWG.

#### **3.05 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to

approval of Departmental Representative  
installation.

and local authority having jurisdiction over

- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

**END OF SECTION**





## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

### **1.02 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Governing Authorities.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 SUPPORT CHANNELS**

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

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Secure equipment to poured concrete with expandable inserts.
- .2 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole malleable iron, steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.

- .5 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia 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.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCE**

- .1 CSA C22.2 no 40 m1999 (R1999), Cutout, Junction and Pull Boxes.
- .2 CSA C22.2 no 76 m92 (R2002), Splitters.

### **1.02 RELATED REQUIREMENTS**

- .1 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

### **1.03 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 SPLITTERS**

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs in splitters less than 400 A.

### **2.02 JUNCTION AND PULL BOXES**

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

- .3 NEMA 4 when installed in tunnels and adjacent areas open to tunnels.

## **2.03 CABINETS**

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm G1S plywood backboard for surface flush mounting.

## **3 EXECUTION**

### **3.01 SPLITTER INSTALLATION**

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

### **3.02 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

### **3.03 IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Association canadienne de normalization (CSA)/CSA International.
  - .1 CSA C22.10.10-2010, Code canadien de l'électricité, Première partie et modifications du Québec.
- .2 CSA C22.2 no 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

### **1.02 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

## **2 PRODUCTS**

### **2.01 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.10.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

### **2.02 SHEET STEEL OUTLET BOXES**

- .1 Electro-galvanized steel single gang flush device boxes for flush installation, minimum size 76 x 50 x 63 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

## **2.03 CONDUIT BOXES**

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

## **2.04 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 26 05 21 – Wires and Cables (0-1000V).
- .2 Section 26 05 29 – Hangers and Supports for Electrical Systems.

### **1.02 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2-M1984 (R2003), Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

### **1.03 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 cable 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.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

## **2 PRODUCTS**

### **2.01 CABLES AND REELS**

- .1 Provide cables on reels or coils.
  - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.

### **2.02 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings, with expanded ends.
- .3 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .4 Flexible metal conduit: to CSA C22.2 No. 56, steel, liquid-tight flexible metal.

### **2.03 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.

### **2.04 CONDUIT FITTINGS**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

### **2.05 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .2 Weatherproof expansion fittings for linear expansion at entry to panel.



## **2.06 FISH CORD**

- .1 Polypropylene.

## **3 EXECUTION**

### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

### **3.02 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, in unfinished areas.
- .3 Use electrical metallic tubing (EMT) except in cast concrete and when above 2.4 m and not subject to mechanical injury.
- .4 Use rigid pvc conduit underground and in cast concrete.
- .5 Use flexible metal conduit for connection to motors in dry areas, connection to surface or recessed fluorescent fixtures, work in movable metal partitions.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment, in tunnels, in damp, wet or corrosive locations.
- .7 Install conduit sealing fittings in hazardous areas.
  - .1 Fill with compound.
- .8 Minimum conduit size for lighting and power circuits: 19 mm.
- .9 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 19 mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.

### **3.03 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

### **3.04 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.

### **3.05 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel.
  - .1 Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.

### **3.06 CONDUITS UNDERGROUND**

- .1 Slope conduits to provide drainage.

### **3.07 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**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.1 No.126.1-02, Metal Cable Tray Systems.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA VE 1-2002, Metal Cable Tray Systems.
  - .2 NEMA VE 2-2001, Cable Tray Installation Guidelines.

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings: submit shop drawings showing materials, finish, dimensions, accessories, layout, and installation details.
- .3 Identify types of cabletroughs used.
- .4 Show actual cabletrough installation details and suspension system.

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

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

## **2 PRODUCTS**

### **2.01 CABLETROUGH**

- .1 Cabletroughs and fittings: to NEMA VE 1 and CAN/CSA C22.1 No. 126.1.
- .2 Ladder type, Class D1 to CAN/CSA C22.2 No.126.1.
- .3 Trays: aluminium width as indicated and depth of 150 mm.
- .4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cabletrough supplied.
  - .1 Radii on fittings: 600 mm minimum.
- .5 Barriers where different voltage systems are in same cabletrough.
- .6 Ground cable trays with #3/0 AWG bare copper conductor attached to each tray section in accordance with CEC requirements.
- .7 Provide fire stop material at firewall penetrations.

## **2.02 SUPPORTS**

- .1 Provide splices, supports for a continuously grounded system as required.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install complete cabletrough system in accordance with NEMA VE 2.
- .2 Support cabletrough on both sides.
- .3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

### **3.02 CABLES IN CABLETROUGH**

- .1 Install cables individually.
- .2 Lay cables into cabletrough. Use rollers when necessary to pull cables.
- .3 Secure cables in cabletrough at 3 m centres, with nylon ties.
- .4 Identify cables every 30 m with size 2 nameplates in accordance with Section 26 05 00 - Common Work Results for Electrical.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .3 Section 26 05 00 – Common Work Results for Electrical.

### **1.02 REFERENCES**

- .1 Canadian Standards Association, (CSA International).
- .2 Insulated Cable Engineers Association, Inc. (ICEA).

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
- .6 Do not dispose of preservative treated wood through incineration.
- .7 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.
- .8 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative.
- .9 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 CABLE PROTECTION**

- .1 38 x 140 mm plywood pressure treated with clear, coloured or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

- .2 Ruban indicateur métallisé, selon les indications.

### **3 EXECUTION**

#### **3.01 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
  - .1 Do not pull spliced cables inside ducts.
- .2 Install multiple cables in duct simultaneously.
- .3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .5 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.
- .6 After installation of cables, seal duct ends with duct sealing compound.

#### **3.02 CABLE INSTALLATION IN TRENCHES**

- .1 Install copper aluminium alloy TECK cables in underground trenches, as indicated and as per manufacturer's recommendations.
- .2 Submit to the Departmental Representative cable ampacity calculations from the cable manufacturer with cable installation as defined on drawing.
- .3 Submit an official manufacturer's inspection certification stating that the installation conforms to manufacturer's requirements.

#### **3.03 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide 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. 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 1000 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 Acceptance Tests
  - .1 Ensure that terminations and accessory equipment are disconnected.
  - .2 Ground shields, ground wires, metallic armour and conductors not under test.
  - .3 High Potential (Hipot) Testing.
    - .1 Conduct hipot testing at original factory test voltage in accordance with manufacturer's ICEA recommendations.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

**END OF SECTION**





## **1 GENERAL**

### **1.01 RELATED DOCUMENTS**

- .1 The General Conditions of the Contract are applicable to this section, including General Clauses and Technical Clauses, as well as the specifications sections of Division 01.

### **1.02 SUMMARY**

- .1 This section involves the following items:
  - .1 Pad-type isolators (vibration dampers) for seismic restraint.
  - .2 Seismic spring isolators.
  - .3 Seismic movement limiters.
  - .4 Brace and cable restraints.
  - .5 Suspension rod stiffeners.
  - .6 Anchor sockets and washers.

### **1.03 PERFORMANCE ESTIMATES**

- .1 This section is performance specification for the following items:
  - .1 Calculations, design and verification of the seismic restraint devices for the overall work in Division 26. It is obligatory to appoint an engineer for these purposes. Refer to the section “Engineer Services”.

### **1.04 ENGINEER SERVICES**

- .1 Retain the services of an engineer and commission him/her to:
  - .1 Perform the calculations, complete design and verification of the seismic restraints and systems necessary for the overall work in Division 26, in compliance with all of the requirements of this section. The calculations for the exterior equipment must take into account the wind load.
  - .2 Produce, assemble and provide shop drawings, technical files, design notes, and other documents related to calculations, design and products. Refer to the section “Items to be Submitted for Action” and “Quality Assurance”.
  - .3 Assemble the information necessary for equipment calculations described in other sections, for example:
    - .1 Equipment dimensions.
    - .2 Location of the equipment’s gravitational center.
    - .3 Location of the mounting and anchoring devices.

- .4 Perform periodic visits in order to verify the quality of the implementation. Refer to the section “Onsite Quality Control” in Section 3.
  - .5 Supervise the trial activities and inspections mentioned in the section “Onsite Quality Control” in Section 3.
  - .6 Produce and sign the Certificate of Conformity.
  - .7 Refer to the section “Items to be Submitted at Work Completion”.
- .2 Qualifications
- .1 The Engineer, hereinafter referred to as the “Qualified Engineer”, must be a member in good standing of the “Ordre des ingénieurs du Québec” or OIQ (Quebec corporation of engineers) specialising in and recognized in the field of seismic protection of functional and operational building components. He should be well versed in the standards referenced in that section and the provisions in Section 4 of the “Code de la construction du Québec” or CCQ (Quebec Building Code) related to the calculations for seismic restraint devices.
  - .2 Provide, on demand, the Qualified Engineer’s *Curriculum vitae*.

## 1.05 REFERENCES

- .1 AASHTO: American Association of State Highway and Transportation Officials.
- .2 ASTM: American Society for Testing and Materials.
  - .1 ASTM A36/A36M-05: Standard Specification for Carbon Structural Steel
  - .2 ASTM E 488-96 (2003): Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
  - .3 ASTM A492-95 (2004): Standard Specification for Stainless Steel Rope Wire
  - .4 ASTM A603-98 (2003): Standard Specification for Zinc-Coated Steel Structural Wire Rope
- .3 AWS: American Welding Society
  - .1 AWS D1.1/D1.1M, Structural Welding Code - Steel.
- .4 CCQ: Code de construction du Québec (Quebec building code) – “Chapitre 1, Bâtiment, et Code national du bâtiment – Canada 2010 (modifié) (*Chapter 1, building and national code for building* – *Canada 2010 (modified)*)).
- .5 CSA: Canadian Standards Association.
  - .1 CAN/CSA W47.1-03: Certification of Companies for Fusion Welding of Steel.
  - .2 CAN/CSA W59-03: Welded Steel Construction (Metal Arc Welding).

- .3 CSA C22.10-F10: "Code de construction du Québec" (Quebec building code), "Chapitre V – Électricité - Code canadien de l'électricité, Première partie (Vingt et unième édition) et Modifications du Québec (*Chapter V – "Electricity – Canadian Electrical Code, Part One (21<sup>st</sup> Edition) and Modifications by Quebec*)".
- .4 CSA S832-06: "Diminution des risques sismiques concernant les composants fonctionnels et opérationnels des bâtiments (CFO) » (*Seismic risk reduction concerning functional and operation building components*)" (CFO))
- .6 FEMA: Federal Emergency Management Agency
  - .1 FEMA-413/January 2004: Installing Seismic Restraints for Electrical Equipment.
- .7 ICC-ES: ICC Evaluation Service.
- .8 MFMA: Metal Framing Manufacturers Association.
  - .1 MFMA-4: Metal Framing Standards Publication.
- .9 OIQ: "Ordre des ingénieurs du Québec" (Quebec corporation of engineers).
- .10 OSHPD: Office of Statewide Health Planning and Development for the State of California.

#### 1.06 PERFORMANCE ESTIMATES

- .1 Loads and effects caused by earthquakes:
  - .1 Location categories, as per the CCQ definition: Determine the seismic location category (A, B, C, D, E or F) in accordance with paragraph 4.1.8.4 of the CCQ.
    - .1 Unless otherwise directed by the Qualified Engineer, in the absence of existing geotechnical data that would help to determine the seismic location category, use Category E, unless there is a possibility it could be a Category F. If there is any doubt about whether it could be Category E or F, use F.
  - .2 Risk category assigned as per the CCQ definition: Determine the risk category assigned to the building (i.e. "Low", "Normal", "High", or "Civil Protection") in accordance with paragraph 4.1.2.1 of the CCQ.
  - .3 Coefficients for electrical elements and components:
    - .1 For each element or component, determine the seismic coefficient (Cp), the response modification coefficient (Rp), and the force amplification coefficient (Ar) in accordance with paragraph 4.1.8.17 of the CCQ.
  - .4 The coefficient categories and values used to perform the calculations must be present in the shop drawings and be justified in the design notes submitted.
- .2 Existing buildings: install seismic protection devices for new equipment as if they were part of a new building.

#### 1.07 ITEMS TO BE SUBMITTED FOR ACTION

- .1 Conform to the requirements in Section 01 33 00 – Submittal Procedures.
- .2 Product data as follows:
  - .1 Give the rated load, nominal deformation, and the overload capacity for each vibration damper.
  - .2 Illustrate and indicate the model, materials, resistance, fixation means, and finish for each type and component size for the seismic restraint device used.
    - .1 In table format, indicate the types and sizes of the restraints, and add the numbers of the test reports and the nominal values of tensile strength and shear that have been evaluated by an evaluation service member of the ICC-ES, OSHPD, or an agency certified by authorities in that jurisdiction.
    - .2 Make annotations to indicate the function of each proposed product and its compliance with the estimate.
  - .3 Travel limiters for all directions: indicate the nominal characteristics for the horizontal, vertical and combined loads.
- .3 Documents concerning the design as follows: For the details of the vibration dampers and seismic restraints before complying with performance requirements and design criteria, including analysis data signed by the Qualified Engineer responsible for their preparation.
  - .1 Design calculations: Calculate the static and dynamic loads due to weight and equipment function, and seismic forces determining the choice of vibration isolators and seismic restraint devices.
  - .2 Seismic restraint device details:
    - .1 Design analyses: Corroborate the choice and the layout of the anchors of the seismic restraint devices. Include the tensile strength and combined shear calculations
    - .2 Details: Manufacturing and layout details. Provide details of the selected anchors for the seismic restraint devices, the components and the structure. Show the placement of the anchors, their spacing, and installation methods. Identify the components, list their resistance, and indicate the direction and values transmitted to the structure during an earthquake. Demonstrate their association with the vibration dampers.
  - .3 Evaluation documentation and prior approval: By an evaluation service member of the ICC-ES, OSHPD, or an agency certified by authorities in that jurisdiction, displaying the maximum amount of characteristics for each restraint device and the items on which approval (tests or calculations) are based.

- .4 Coordination drawings: Demonstrate the coordination between the pipe seismic reinforcement devices and the electrical equipment with the other systems and instruments situated in proximity, including other supports and devices for seismic restraints.

#### **1.08 ITEMS TO BE SUBMITTED FOR INFORMATION**

- .1 Welding certificates.
- .2 Qualification data: for the Qualified Engineer; refer to the section “Engineering Services”.

#### **1.09 ITEMS TO BE SUBMITTED AT THE COMPLETION OF WORK**

- .1 The documents/items must be submitted before the provisionnal acceptance of the work.
- .2 Provide the operation and maintenance records for incorporation into the specified manual in Section 01 78 00 – Closeout Submittals.
- .3 Verification and onsite quality control test reports. Refer to section “*Onsite Quality Control*” in Section 3.
- .4 Certificates of conformity.
  - .1 The Qualified Engineer will produce and sign the certificates of conformity at the following stages:
    - a. At the completion of all concealed works.
    - b. At the completion of all work.
  - .1 The certificate needs to attest that:
    - .1 All of the work of Division 26 complies with the requirements of the CCQ in terms of protection against seismic loads (and wind loads).
    - .2 All of the seismic restraint devices comply with the requirements of this section, as well as the shop drawings submitted and reviewed.

#### **1.10 QUALITY ASSURANCE**

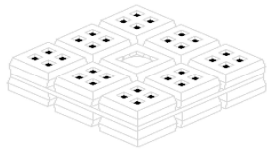
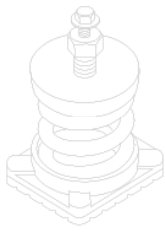
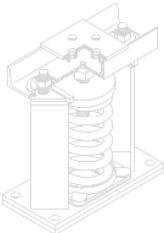
- .1 Conform to all of the CCQ and FEMA-413 requirements related to seismic protection, except in cases where the requirements of the present section are more stringent.
- .2 Welding: Determine the procedures and empower the personnel as per the AWS D1.1/D1.1M, “Structural Welding Code – Steel”.

- .3 The seismic restraint devices must undergo horizontal and vertical load tests and analysis, and their OSHPD anchors must display an OPA approval number and have received approval from the ICC-ES, or prior approval from an agency certified by authorities in that jurisdiction, displaying the maximum amount of characteristics for each seismic restraint device. The characteristics based on independent testing are preferable to those based on calculations. In the case where pre-approved characteristics are not available, data based on independent testing is preferable. The calculations (including calculations of combined tensile and shear loads) that support the seismic restraint device designs must be signed by the Qualified Engineer.
- .4 Comply with the requirements in the CSA C22.10 standards.

## 2- PRODUCTS

### 2.01 VIBRATION DAMPERS

- .1 Manufacturers: Subject to compliance with the specifications, the products will be provided by one of the following manufacturers:
- .1 Ace Mountings Co., Inc.
  - .2 Amber/Booth Company, Inc.
  - .3 California Dynamics Corporation.
  - .4 Isolation Technology, Inc.
  - .5 Kinetics Noise Control.
  - .6 Mason Industries.
  - .7 Vibration Eliminator Co., Inc.
  - .8 Vibration Isolation.
  - .9 Vibration Mountings & Controls, Inc.
- .2 CE-1 model: pad-type isolators: arranged in single or multiple layers of sufficient rigidity so that the load is uniformly distributed on the surface of the isolators, molded with a non-slip texture and equipped with base plates of galvanized steel, and cut at the factory to match the characteristics of the supporting equipment.
- .1 Resilient materials: Neoprene, rubber, or compressed fiberglass that is resistant to oil and water.

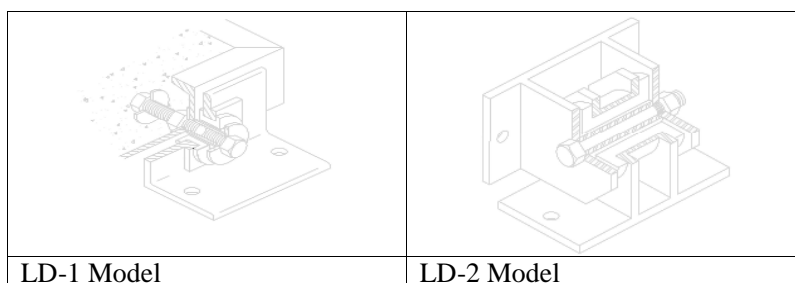
|   |   |   |
|---|---|---|
|  |  |  |
| CE-1 Model  | IR-1 Model  | IR-2 Model  |

- .3 IR-1 model: Spring isolators: Freestanding isolator springs, laterally stable.
  - .1 Diameter outside of the springs: Must not be inferior to 80% of the height of the compressed spring under the rated load.
  - .2 Minimum additional travel: 50% of the specified deflection under the rated load.
  - .3 Lateral rigidity: Superior to 80% of the rated vertical rigidity.
  - .4 Overload capacity: Must be able to withstand 200% of the rated load, fully compressed, without deformity or failure.
  - .5 Base plate: Factory-pierced for bolting to the structure and glued to the rubber vibration damper with a thickness of 6 mm (1/4 inch), secured to the underside of the base plate. The base plates should reduce the load on the floor at 3,447 kPa (500 psig).
  - .6 Top plate and adjustable bolt: Threaded top plate with an adjustable bolt with a clamping screw to secure and upgrade the equipment.
- .4 IR-2 model: Seismic spring isolators: Open steel spring isolators, freestanding, with seismic restraints or snubber.
  - .1 Housing: made of steel with vertical elastic snubbers to prevent the spring from stretching when the load is removed, factory-pierced base plate glued to a vibration damper made of neoprene or rubber 6 mm (1/4 inch thick), secured to the underside of the base plate, and adjustable mounting the equipment and leveling bolts that will lock it during installation.
  - .2 Clamping device: Seismic device or snubber as required for the equipment and authorities in the jurisdiction.
  - .3 Outside diameter of the spring: Must not be less than 80% of the height of the compressed spring under the rated load.
  - .4 Minimum additional travel: 50% of the specified deflection under the rated load.
  - .5 Lateral rigidity: Superior to 80% of the rated vertical rigidity.
  - .6 Overload capacity: Must be able to withstand 200% of the rated load, fully compressed, without deformity or failure.

## 2.02 SEISMIC RESTRAINT DEVICES

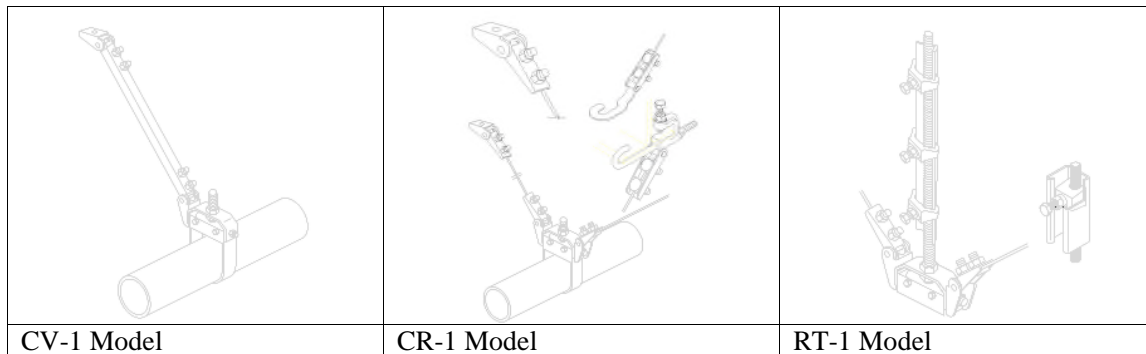
- .1 Manufacturers: Subject to compliance with specifications, the products will be provided by one of the following manufacturers:
  - .1 Amber/Booth Company, Inc.
  - .2 California Dynamics Corporation.
  - .3 Cooper B-Line, Inc.; a division of Cooper Industries.
  - .4 Hilti, Inc.
  - .5 Kinetics Noise Control.

- .6 Loos & Co.; Cableware Division.
- .7 Mason Industries.
- .8 TOLCO Incorporated; a brand of NIBCO INC.
- .9 Unistrut; Tyco International, Ltd.
- .2 General requirements for the restraints: the nominal resistance, characteristics and applications must be those that are defined in the reports from the evaluation service member of the ICC-ES, OSHPD, or an agency certified by authorities in that jurisdiction.
- .3 LD-1 and LD-2 models: seismic snubbers: Factory made from profiles and welded steel sheets, anchor bolts, and washers and resilient and replaceable insulating sleeves.
  - .1 The anchoring bolts used to anchor them to the concrete must be seismic-rated, pre-drilled, with a bevelled stud or female cone.
  - .2 Rings and insulating bushings: made from resistant oil and water resistant neoprene
  - .3 Maximum air gap of 6 mm (1/4 inch), and elastic cushion of a minimal thickness of 6 mm (1/4 inch).

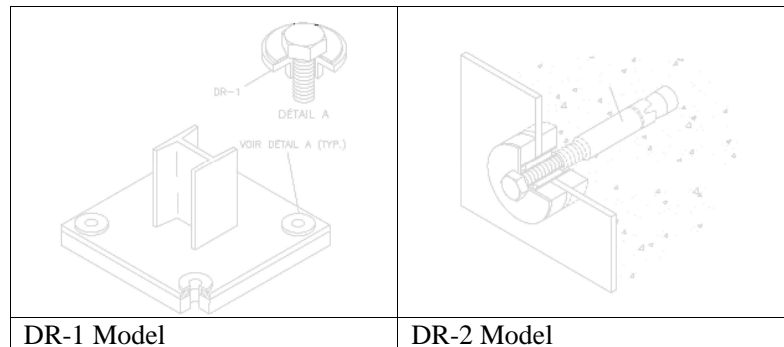


- .4 CV-1 model: U-profile brace: brace made in a factory or onsite, in accordance with the MFMA-4 standard, made in a U-profile with steel slots. At one end, the brace will be anchored to a brace component, while the other and will be anchored to the building structure, as well as other assorted components. The supports are protected by corrosion-resistant coating and must be resistant to tension, compression and specified torsion.
- .5 CR-1 model: Cable brace consisting of ASTM A 603 galvanized steel when installed indoors and of ASTM A 492 stainless steel for exterior or corrosive environments – steel cables with end fittings made of steel comprising lug sets, fasteners, joints, and bolts designed to work with retaining cables, and containing at least two clamping bolts for attached the cable.
- .6 RT-1 model: Hanger rod stiffener: steel pipe or support sleeve with slot bolted to the hanger rod, or a steel reinforced bracket attached to the hanger rod.





- .7 DR-1 model: Sleeves for stem anchor (floor mounts): Neoprene sleeves for rigid support of the equipment and assorted types and dimensions of bolts and studs.
- .8 DR-2 model: Sleeves for wall anchors: Neoprene elements and steel sleeves for the rigid equipment supports and assorted types and dimensions for the fastener devices used.
- .9 Washers and resilient insulating sleeves: one-piece, moulded, made of water and oil resistant neoprene, with a flat flange.



- .10 Mechanical anchoring bolts: pre-drilled, bevelled stud or female cone, made of galvanized steel to be used indoors, and stainless steel for use outside. Select the anchoring bolts with the strength required for anchoring tests according to ASTM E 488. Minimum length must be equal to 8 times the diameter.
- .11 Chemical anchor bolts: Pre-drilled anchorage system, with a capsule containing polyvinyl resin or a base of methacrylate urethane and an accelerator, or a polymeric adhesive or mortar injected hybrid system. Provide anchoring bolts and accessories in galvanized steel for indoor use and stainless steel for outdoor use. Select the anchoring bolts with the strength required for anchoring tests according to ASTM E 488.

## **2.03 FACTORY FINISH**

- .1 Finish: Standard manufacturer paint applied before the equipment is shipped and factory testing.
  - .1 Powder coating on springs and housings.
  - .2 The accessories must be galvanized. Components for use outdoors must be hot-dipped galvanized.
  - .3 Baked enamel coating or powder for the metal components used in the isolators used indoors.
  - .4 Use color codes or other types of identification for the vibration isolators and seismic restraints to indicate their range of capacities.

## **3 EXECUTION**

### **3.01 INSPECTION**

- .1 Inspect the areas and equipment that will be receiving the vibration isolators and seismic restraints in order to verify compliance with the requirements in regards to installation tolerances and other conditions that could affect the behavior of the isolators and restraints.
- .2 Inspect the primary installation of the reinforcements and the cast-in-place anchors in order to verify the actual locations before installation.
- .3 Do not proceed with installation if unsatisfactory conditions have not been addressed.

### **3.02 APPLICATIONS**

- .1 Cable ducts and multiple cables: Fix the cable ducts and cables to trapezoidal frames with clamps approved for application by an evaluation service member of the ICC-ES, OSHPD, or an agency certified by authorities in that jurisdiction.
- .2 Rod stiffeners: Install the rod stiffeners where required in order to prevent the rods from buckling during seismic activity.
- .3 Strength of the seismic restraints and supports: When there is no indication, choose component sizes that will have sufficient strength to support the current and future static and seismic loads within the specified loads.

### **3.03 INSTALLATION OF THE VIBRATION DAMPENING DEVICES AND SEISMIC RESTRAINTS**

- .1 Comply with the requirements of Division 07 for the installation of roof-mounted rails, support equipment, and components crossing the roof.
- .2 Seismic restraint equipment:

- .1 Install seismic snubbers on the electrical equipment mounted on the vibration isolators. Install snubbers as closely as possible to the vibration isolators and the bolts at the base of the equipment and on the support structure.
- .2 Install resilient insulation washers on the equipment's anchorage bolts when the space between the anchors and the adjacent surface is greater than 3.2 mm (0.125 inches).
- .3 Install the seismic restraints using the methods approved by an evaluation service member of the ICC-ES, OSHPD, or an agency certified by authorities in that jurisdiction and by submitting for verification the required documents for the component. Refer to the section "Items to be Submitted for Action".
- .3 Restraints for lighting fixtures:
  - .1 Comply with the requirements in FEMA-413, notably for appliances installed in suspended ceilings: Follow steps 1 to 4, found on pages 149 and 150 of the said document.
- .4 Install the cables so that they do not bend at the corners of the adjacent equipment or building structure.
- .5 Install the seismic restraints using the methods approved by an evaluation service member of the ICC-ES, OSHPD, or an agency certified by authorities in that jurisdiction and by submitting for verification the required documents for the component. Refer to the section "Items to be Submitted for Action".
- .6 Install the sleeves for the anchoring bolts for the equipment installed at ground-level in such a way that it is possible to install a resilient material between the anchoring bolt and the attachment hole in the concrete base.
- .7 Install sleeves for the wall-mounted equipment bolts in such a way as to allow for the installation of resilient materials in the area where the equipment or the mounting profiles are attached to the wall.
- .8 Anchoring to the structure: if a specific type of anchor is not indicated, secure the brace to the beam flanges, the upper chords of the trusses, or to the concrete elements.
- .9 Pre-drilled anchorages:
  - .1 The anchor-type expansion bolts are not authorized for non-isolated power equipment of more than 10 hp (7.46 kW).
  - .2 Identify the position of the steel reinforcements or of all built-in elements prior to the anchorage holes being drilled. Do not damage the reinforced steel or built-in items during coring or drilling. Advise the structural Departmental Representative if you encounter reinforcing steel or other embedded items during drilling. Locate and avoid pre-stressed reinforcements, electrical and telecommunication conduits, as well as gas lines.
  - .3 Do not drill holes into the concrete or masonry until the concrete, mortar or grout has reached is full design strength.

- .4 Expansion bolts: Protect the threads against damage during the installation of the anchor. Install the reinforced anchor shells by fully engaging the shell in the structural element to which the anchor is to be attached.
- .5 Chemical anchors: Clean the holes to remove any foreign material and drilling dust before applying the adhesive. Put the adhesive into the holes starting from the bottom and working upwards to the surface, to avoid the formation of air pockets.
- .6 Tighten the anchors using the torque recommended by the manufacturers, using a torque wrench.
- .7 Install galvanized anchors indoors, and use stainless steel anchors for exterior applications.

### **3.04 ABSORPTION OF SEISMIC DIFFERENTIAL DISPLACEMENTS**

- .1 Install flexible connections in the sections of cable ducts, cables, wireways, and busways at places where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and when the last connection from a device anchored to an element different from the supporting structure ahead of the equipment.

### **3.05 ONSITE QUALITY CONTROL**

- .1 Periodic visits by the Qualified Engineer:
  - .1 The Qualified Engineer must perform periodic visits to the work site in order to verify the following (but not limited to):
    - .1 Quality of the implementation.
    - .2 That the facilities are in compliance with his/her instructions, plans, quotes and calculations.
    - .3 That the anchorage points on the structure are in compliance with his/her instructions.
    - .4 That the products used correspond to the technical sheets submitted.
    - .5 That the installations are in compliance with codes and standards.
  - .2 The frequency of visits by the Qualified Engineer must be at his/her own discretion, however at a minimum, performed at the following stages:
    - .1 Once the products are delivered and stored at the site.
    - .2 Once the preparatory work and other previous work has been completed, but before installation begins.
    - .3 Twice during the course of the work, in other words, once work completion has reached 25% and 60%.
    - .4 Upon the completion of all of the concealed work.
    - .5 Upon completion of all of the work.

- 
- .6 During the tests and inspections that need to be supervised. Refer to the sub-section "Tests and Inspections".
  - .2 Tests and Inspections:
    - .1 Perform the tests and inspections under the supervision and presence of the Qualified Engineer.
    - .2 Provide evidence that the test apparatus has recently been calibrated by an agency certified by authorities in that jurisdiction.
    - .3 Schedule the tests with the Departmental Representative, through the engineer intermediary, before connecting an anchor that holds the component (unless the test after connection has been approved), and that, after notice has been given seven days in advance.
    - .4 Obtain the approval of the Qualified Departmental Representative before applying load tests to the structure. Provide temporary braces to distribute the loads.
    - .5 Conduct tests on at least four anchors and fasteners of each installed type and size, at the discretion of the Engineer.
    - .6 Perform tests up to 90% of the rated load of each device.
    - .7 Measure the clearance of the restraint's isolating device.
    - .8 Measure insulator deflections.
    - .9 Verify the minimum clearances for the spacers.
    - .10 In the case where one of the devices fails, modify all of the installations of the same type and conduct further tests until satisfactory results are achieved.
    - .11 The Qualified Engineer must prepare test and inspection reports and submit them to the Engineer.

### **3.06 SETTINGS**

- .1 Adjust the isolators once the isolated equipment has reached its working order weight.
- .2 Adjust the snubbers on the spring insulators so that the equipment can be installed at its normal operating height. After installing the hardware, adjust the snubbers so that they do not come into contact during normal operation.
- .3 Set the active operating height of the spring isolators.
- .4 Adjust the retainers so that the equipment can move freely during normal operation.

### **TECHNICAL SCHEDULE OF VIBRATION DAMPERS AND SEISMIC RESTRAINT DEVICES – ELECTRICAL INSTALLATION**

| TECHNICAL SCHEDULE OF VIBRATION DAMPERS AND SEISMIC RESTRAINT DEVICES: ELECTRICAL INSTALLATION |   |                             |                   |                |        |           |                                |      |                                |          |
|--|---|-----------------------------|-------------------|----------------|--------|-----------|--------------------------------|------|--------------------------------|----------|
|  | Equipment Identification                | Location of Equipment       | Vibration Dampers |                |        | Isolators |                                | Base |                                | Comments |
|  |   |                             | Type              | Thickness (mm) | Number | Type      | Minimum static deflection (mm) | Type | Minimum static deflection (mm) |          |
| 1  | Main distribution panel PPD-C15-1-A     | Building C15                |                   |                |        |           |                                |      |                                |          |
| 2  | Panel PPD-C15-1-B                       | Building C15                |                   |                |        |           |                                |      |                                |          |
| 3  | Panel PD-C15-1-A                        | Building C15                |                   |                |        |           |                                |      |                                |          |
| 4  | Panel PPDU-C15-1A                       | Building C15                |                   |                |        |           |                                |      |                                |          |
| 5  | Panel PDU-C15-1-A                       | Building C15                |                   |                |        |           |                                |      |                                |          |
| 6  | Busduct 5000A                           | Building C15                |                   |                |        |           |                                |      |                                |          |
| 7  | Busduct BB1 2500A                       | Building C15                |                   |                |        |           |                                |      |                                |          |
| 8  | Busduct BB2 2500A                       | Building C15                |                   |                |        |           |                                |      |                                |          |
| 9  | Automatic transfer switch (ITQ-C15-1-A) | Building C15                |                   |                |        |           |                                |      |                                |          |
| 10   | Cabletrays                              | Building C15 and 1 basement |                   |                |        |           |                                |      |                                |          |
| 11   | Panel PD-K3-SS-A                        | Tunnel K3                   |                   |                |        |           |                                |      |                                |          |
| 12   | Panel PDU-K3-SS-A                       | Tunnel K3                   |                   |                |        |           |                                |      |                                |          |
| 13   | Panel PD-K2-SS-A                        | Satelite electrical room    |                   |                |        |           |                                |      |                                |          |
| 14   | Panel PD-K2-SS-B                        | Satelite electrical room    |                   |                |        |           |                                |      |                                |          |
| 15   | Panel PDU-K2-SS-A                       | Satelite electrical room    |                   |                |        |           |                                |      |                                |          |

| TECHNICAL SCHEDULE OF VIBRATION DAMPERS AND SEISMIC RESTRAINT DEVICES: ELECTRICAL INSTALLATION |   |                          |                   |                |        |           |                                |      |                                |          |
|--|---|--------------------------|-------------------|----------------|--------|-----------|--------------------------------|------|--------------------------------|----------|
|  | Equipment Identification                      | Location of Equipment    | Vibration Dampers |                |        | Isolators |                                | Base |                                | Comments |
|  |   |                          | Type              | Thickness (mm) | Number | Type      | Minimum static deflection (mm) | Type | Minimum static deflection (mm) |          |
| 16   | Panel PDU-K2-SS-B                             | Satelite electrical room |                   |                |        |           |                                |      |                                |          |
| 17   | Panel PD-1-SS-A                               | Building basement 1      |                   |                |        |           |                                |      |                                |          |
| 18   | Panel PD-1-SS-B                               | Building basement 1      |                   |                |        |           |                                |      |                                |          |
| 19   | Panel PDU-1-SS-A                              | Building basement 1      |                   |                |        |           |                                |      |                                |          |
| 20   | Panel PDU-1-SS-B                              | Building basement 1      |                   |                |        |           |                                |      |                                |          |
| 21   | Panel PD-K6-SS-A                              | Tunnel K6                |                   |                |        |           |                                |      |                                |          |
| 22   | Panel PD-K6-SS-B                              | Tunnel K6                |                   |                |        |           |                                |      |                                |          |
| 23   | Panel PDU-K6-SS-A                             | Tunnel K6                |                   |                |        |           |                                |      |                                |          |
| 24   | Panel PDU-K6-SS-B                             | Tunnel K6                |                   |                |        |           |                                |      |                                |          |
| 25   | All electrical equipment not mentioned above. |                          |                   |                |        |           |                                |      |                                |          |
|  | 1 :   |                          |                   |                |        |           |                                |      |                                |          |
|  | 2 :   |                          |                   |                |        |           |                                |      |                                |          |
|  | 3 :   |                          |                   |                |        |           |                                |      |                                |          |
|  | 4 :   |                          |                   |                |        |           |                                |      |                                |          |

END OF SECTION





## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 26 22 19 – Control and Signal Transformers.

### **1.02 REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C39.1-1981, Requirements, Electrical Analog Indicating Instruments.
- .2 Canadian Standards Association, (CSA International)
  - .1 CAN3-C17-M84 (R1999), Alternating - Current Electricity Metering.

### **1.03 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate meter, instrument, outline dimensions, panel drilling dimensions and include cutout template.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 METER**

- .1 Digital meter, 2 element kilowatt meter, kilowatthour meter, frequency meter, integrator, indicator, maximum value register, in conformance with CAN3-17.
- .2 Meters and energy and maximum recorders : in conformance with CAN3-17.
- .3 Accuracy : 1 %.

- .4 Interior use, flush mounted.
- .5 Nominal characteristic : as indicated.
- .6 Register: self-contained instrument transformer, operated, clock, cyclometer, range 0-4000 kW, pulse contacts for transmitting signal.
- .7 Backnet interface for remote operation with a 3 conductor RS-485 Cable.
- .8. Model : Schneider serie ION6200 or approved equal.

## **2.02 METERING INSTRUMENT TRANSFORMER CABINET**

- .1 Section within main panel complete with mounting back-plate to house potential and current transformers, fuses, testing and accessory terminal blocks, factory-rewired and fully pre-installed.

## **2.03 TEST TERMINAL BLOCKS**

- .1 Test terminal blocks: as required.

## **2.04 SHOP INSTALLATION**

- .1 Ensure adequate spacing between current transformers installed on each phase.
- .2 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.

# **3 EXECUTION**

## **3.01 METERING INSTALLATION**

- .1 Install meters and instruments in location free from vibration and shock.
- .2 Make connections in accordance with diagrams.
- .3 Connect meter and instrument transformer cabinets to ground.

## **3.02 FIELD QUALITY CONTROL**

- .1 Conduct tests in accordance with Section 26 05 00 - Common Work Results - Electrical and in accordance with manufacturer's recommendations.
- .2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.

- .4 Perform tests to obtain correct calibration.
- .5 Do not dismantle meters and instruments.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 26 05 28 – Grounding - Secondary.

### **1.02 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2 No.47-M90(R2001), Air-Cooled Transformers (Dry Type).
  - .2 CSA C9-M1981(R2001), Dry-Type Transformers.
- .2 National Electrical Manufacturers Association (NEMA)

### **1.03 PRODUCT DATA**

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

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal ,paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 TRANSFORMERS**

- .1 Use transformers of one manufacturer throughout project and in accordance with recommended products.
  - .1 Type : K1
  - .2 Three phase rating as indicated, primary voltage 600 V, secondary voltage 120/208 V, 3 phases, 4 wire, 60 Hz.
  - .3 Taps : 2x2.5% FCAN et 2 x2.5% FCBN.
  - .4 Insultation : class 220C, temperature rise.
  - .5 BIL : standard.
  - .6 Dielectric strength : standard.
  - .7 Sound rating : standard.

- .8 Impedance at 17 degree Celsius : standard.
- .9 Enveloppe : type CSA 2, front accessible panel.
- .10 Installation : suspended or floor mounted.
- .11 Finish in accordance with section 26 05 00 – Common Work Results for Electrical.
- .12. Products : Delta, Hammond, Square D.

## **2.02 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Label size: 7.
- .3 Nameplate wording: as indicated.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Mount dry type transformers up to 75 kVA as indicated.
- .2 Mount dry type transformers above 75 kVA on floor.
- .3 Ensure adequate clearance around transformer for ventilation.
- .4 Install transformers in level upright position.
- .5 Remove shipping supports only after transformer is installed and just before putting into service.
- .6 Loosen isolation pad bolts until no compression is visible.
- .7 Make primary and secondary connections in accordance with wiring diagram.
- .8 Energize transformers after installation is complete.

**END OF SECTION**

## **1 GENERAL**

### **1.01 CONTROL AND SIGNAL TRANSFORMERS**

- .1 Materials and voltage and current transformers as well as their installation.

### **1.02 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 21 – Construction/Demolition Waste Management And Disposal.

### **1.03 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN3-C13-M83(R1998), Instrument Transformers.

### **1.04 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate dimensions and connection details.

### **1.05 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 POTENTIAL TRANSFORMERS**

- .1 Potential transformers: to CAN3-C13, dry type for indoor use, with following characteristics:
  - .1 Nominal voltage class: 600V.
  - .2 Rated frequency: 60 Hz.
  - .3 Basic impulse level: 10 kV.
  - .4 Voltage ratio: 600 up to 120 V.

- .5 Accuracy rating: 0.3B0.1.
- .2 Potential transformers equipped with fuse holder and fuses. Fuses: 1A or as indicated.

## **2.02 CURRENT TRANSFORMERS**

- .1 Current transformers: to CAN3-C13, dry type for indoor use with following characteristics:
  - .1 Nominal voltage class: 600 V.
  - .2 Rated frequency: 60 Hz.
  - .3 Basic impulse level: 10 kV.
  - .4 Metering accuracy rating: 0.3B0.1.
  - .5 Rating : 4000 à 5A or as indicated.
- .2 Positive action automatic short-circuiting device in secondary terminals.

## **2.03 MOUNTING BRACKETS**

- .1 Potential transformers with channel type mounting brackets.
- .2 Mounting brackets factory installed by the main panel manufacturer.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install instrument transformers in low voltage swithgear and ensure accessibility.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 26 09 23.01 - Metering and Switchboard Instruments.
- .2 Section 26 22 19 - Control and Signal Transformers.

### **1.02 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2 No.31-M89(R2000), Switchgear Assemblies.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC G8-3.3, Metal-Enclosed Interrupter Switchgear Assemblies.

### **1.03 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate on shop drawings:
  - .1 Floor anchoring method and foundation template.
  - .2 Dimensioned cable entry and exit locations.
  - .3 Dimensioned position and size of bus.
  - .4 Overall length, height and depth of complete switchgear.
  - .5 Dimensioned layout of internal and front panel mounted components.
- .3 Indicate on product data:
  - .1 Time-current characteristic curves for air circuit breakers.
- .4 Submit an electrical coordination study for switchgear breakers.

### **1.04 QUALITY ASSURANCE**

- .1 Submit one copy of certified factory test results.

### **1.05 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for secondary switchgear for incorporation into manual in accordance with Section 01 78 00 - Closeout Submittals.
- .2 One copy maintenance data for complete switchgear assembly including components.

### **1.06 STORAGE AND PROTECTION**

- .1 Store switchgear on site in protected, dry location. Cover with plastic to keep off dust.
- .2 Provide energized strip heater in each cell to maintain dry condition during storage.

## **1.07 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **1.08 EXTRA MATERIALS**

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Switchgear assembly: to EEMAC G8-3.3, CAN/CSA-C22.2 No.31.

### **2.02 RATING**

- .1 Secondary switchgear: indoor, 600 /347V, 4000 A, 3 phase, 4 wire, 60 Hz, minimum short circuit capacity 65 kA (rms symmetrical).

### **2.03 ENCLOSURE**

- .1 Main incoming section to contain:
  - .1 Air circuit breaker sized as indicated.
  - .2 Demand meter. See Section 26 09 23.01 - Metering and Switchboard Instruments.
  - .3 Provision for electrical power supply authority metering.
- .2 Distribution sections to contain:
  - .1 Air circuit breaker sized as indicated.
  - .2 Copper bus, from main section to distribution sections including vertical bussing.
- .3 Blanked off spaces for future breakers.
- .4 Metal enclosed, metallic barriers between each section, free standing, floor mounted, indoor, CSA Enclosure 2 cubicle unit.
- .5 Ventilating louvres: vermin, insect, sprinkler proof with easily replaceable fibre glass filters.
- .6 Access from front and rear.
- .7 Steel channel sills for base mounting in single length common to multi-cubicle switchboard.

## **2.04 BUSBARS**

- .1 Three phase and full capacity neutral bare busbars, continuous current rating 4000 A self-cooled, extending full width of multi-cubicle switch board, suitably supported on insulators.
- .2 Main connections between bus and major switching components to have continuous current rating to match major switching components.
- .3 Busbars and main connections: 99.30% conductivity copper.
- .4 Tin plated joints, secured with non-corrosive bolts and Belleville washers.
- .5 Identify phases of busbars by suitable marking.
- .6 Busbar connectors, when switchboard shipped in more than one section.

## **2.05 GROUNDING**

- .1 Copper ground bus not smaller than 50 x 6 mm extending full width of multi-cubicle switchboard and situated at bottom.
- .2 Lugs at each end for size 4/0 AWG grounding cable.

## **2.06 AIR CIRCUIT BREAKER**

- .1 Référer à la Section 26 28 16.01 – Air Circuit Breakers.

## **2.07 INSTRUMENTS**

- .1 Référer à la Section 26 09 23.01 - Metering and Switchboard Instruments .

## **2.08 INSTRUMENT TRANSFORMERS**

- .1 Référer à la Section 26 22 19 - Control and Signal Transformers.

## **2.09 POWER SUPPLY AUTHORITY METERING**

- .1 Separate compartment and metal raceway for exclusive use of power supply authority metering.
- .2 Mounting accessories and wiring for metering supplied by power supply authority:
  - .1 3 potential transformers.
  - .2 3 current transformers.
  - .3 Watthour meter.
  - .4 Demand meter with kW.h register.
  - .5 Ammeter.
  - .6 Voltmeter.
  - .7 Ammeter phase selector switch.
  - .8 Voltmeter phase selector switch.

## **2.10 FINISHES**

- .1 Apply finishes in accordance with Section 26 05 00 - Common Work Results - Electrical.
  - .1 Cubicle exteriors gray.

- .2 Cubicle interiors white ASA 61.

## **2.11 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Nameplates:
  - .1 White plate, black letters, size 7.
  - .2 Complete switchgear labelled: "347/600 V".
  - .3 Main cubicle labelled: "Disjoncteur principal".
  - .4 Distribution units labelled: "as indicated".

## **2.12 SOURCE QUALITY CONTROL**

- .1 Departmental Representative to witness final factory tests.
- .2 Notify Departmental Representative in writing 5 days in advance that switchgear assembly is ready for testing.

## **2.13 MANUFACTURER**

- .1 Design has been coordinated with Schneider equipment and Techno-Contact.
- .2 EATON and Siemens, approved equivalent are accepted.

# **3 EXECUTION**

## **3.01 INSTALLATION**

- .1 Locate switchgear assembly as indicated and bolt to housecleaning pad.
- .2 Connect main secondary power supply to main breaker.
- .3 Connect load side of breakers in distribution cubicles to distribution feeders.
- .4 Check factory made connections for mechanical security and electrical continuity.
- .5 Run one grounding green conductor 4/0AWG copper in 25 mm conduit from ground bus to ground.
- .6 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.29-M1989(R2000), Panelboards and enclosed Panelboards.

### **1.02 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

## **2 PRODUCTS**

### **2.01 PANELBOARDS**

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
  - .1 Install circuit breakers in panelboards before shipment.
  - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated; nameplate must show fault current that panel including breakers has been built to withstand.
- .3 347/600V panelboards: bus and breakers rated for 35 kA (symmetrical) interrupting capacity or as indicated nameplate must show fault current that panel including breakers has been built to withstand.
- .4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

- .5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating as mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges, (door-in-door).
- .10 Trim and door finish: baked grey enamel .
- .11 Panelboards NEMA 2 (sprinklerproof) and NEMA 4 in tunnels and adjacent areas exposed to tunnels.

## **2.02 BREAKERS**

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.
- .4 Except otherwise noted, main breaker shall be installed separately in the upper or lower portion of the panelboard pending upon cable entry. When breaker is vertically mounted, breaker opening shall be downward.

## **2.03 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

## **2.04 MANUFACTURERS**

- .1 Design has been coordinated with Schneider material as supplied by Techno-Contact.
- .2 Approved equivalent EATON and Siemens are accepted.

### **3 EXECUTION**

#### **3.01 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on metallic « U » type channels. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.
- .6 Connect isolated grounds to isolated ground bus.
- .7. Connect bonding and non-isolated grounds to non-isolated ground bus

**END OF SECTION**





## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.27-00, Busways. (Tri-national standard, with UL 857, twelfth edition, and the second edition of NMX-J-148-ANCE.)

### **1.02 PRODUCT DATA**

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

### **1.03 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate in detail exact routing of busways throughout building and in relation to column lines and structural slabs and walls. Provide voltage drop test results for each size of busway.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material [in appropriate on-site bins] for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

## **2 PRODUCTS**

### **2.01 BUSWAYS CHARACTERISTICS**

- .1 Full capacity neutral.
- .2 Enclosed type sprinklerproof CSA 2.
- .3 Low impedance type.
- .4 Joints: silvered, tinplated and of bolt type construction.
- .5 Cold rolled copper bars with 98% minimum conductivity.
- .6 Fittings, factory manufactured to suit type of busway used and as indicated elbows, tees, enclosures, flanged end connections, to switchboards.

- .7 Hangers to suit mounting position and type of busway, edgewise, flatwise or vertical.
- .8 Busway : rated for 65 kA (symmetrical) interrupting capacity.
- .9 Provide a transition section to connect to existing portion of busway to remain.

## **2.02 MANUFACTURER**

- .1 Existing 5000A busway to reconnect is Westinghouse type LoZ.
- .2 New recommended busway shall be Square D type I-Line II or equivalent EATON or Siemens.
- .3 Transition section shall be compatible to existing and new busway.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install busways and associated fittings, supports and accessories in accordance with manufacturer's recommendations.
- .2 Space hangers in accordance with manufacturers recommendations. Maximum spacing 3 m.
- .3 Tighten busway joint bolts to loading recommended by busway manufacturer.
- .4 Cover busways with plastic envelope until building is clean and bus ready to be meggered and energized.
- .5 Megger bus duct in presence of Departmental Representative and have readings approved.
- .6 Retorque single bolt sandwich type busway as recommended by manufacturer.

**END OF SECTION**

## **1 GENERAL**

### **1.01 WIRING DEVICES**

- .1 Switches, receptacles, cover plates and other wiring devices and their installation.

### **1.02 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 21 – Construction/Demolition Waste Management And Disposal.
- .3 Section 26 05 00 - Common Work Results – Electrical.
- .4 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

### **1.03 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-C22.2 No.42-99(R2002), General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CSA-C22.5732 2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
  - .3 CSA-C22.2 No.55-M1986(July 2001), Special Use Switches.
  - .4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

### **1.04 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

### **1.05 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

## **2 PRODUCTS**

### **2.01 SWITCHES**

- .1 20 A, 120 V, single pole, three-way or four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.
- .2 Manually-operated general purpose ac switches with following features:
  - .1 Terminal holes approved for No. 10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine moulding for parts subject to carbon tracking.
  - .4 Suitable for back and side wiring.
  - .5 Ivory toggle.
- .3 Locking fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.
- .5 Acceptable materials: Hubbell serie HBL 1201I and HBL 1203I or approved equivalent.

### **2.02 RECEPTACLES**

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
  - .1 Ivory urea moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Eight back wired entrances, four side wiring screws.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
  - .1 Red urea moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Height back wired entrances, 2 side wiring screws.
  - .4 Break-off links for use as split receptacles.
  - .5 Triple wipe contacts and rivetted grounding contacts.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.
- .5 Acceptable materials: Hubbell serie HBL 5252R or approved equivalent.

### **2.03 COVER PLATES**

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.

- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, vertically brushed, 1 mm thick for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

### **3 EXECUTION**

#### **3.01 INSTALLATION**

- .1 Switches:
  - .1 Install single throw switches with handle in "UP" position when switch closed.
  - .2 Install switches in gang type outlet box when more than one switch is required in one location.
  - .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Receptacles:
  - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2 Mount receptacles at height [in accordance with Section 26 05 00 - Common Work Results - Electrical.
  - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
  - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
  - .2 Install suitable common cover plates where wiring devices are grouped.
  - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 26 23 00 – Low Voltage Switchgear.

### **1.02 REFERENCES**

- .1 American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE)
  - .1 ANSI/IEEE C37.13-1993, Low Voltage AC Power Circuit Breakers Used in Enclosures.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

### **1.03 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include time-current phase protection co- ordination characteristic curves for breakers.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

## **2 PRODUCTS**

### **2.01 AIR CIRCUIT BREAKER**

- .1 Air circuit breaker to: to ANSI/IEEE C37.13 and CSA C22.2 No.5.
- .2 Drawout type (switchgear) and fixed type (switchboard), 600 V class.
  - .1 Continuous current rating : 4 000 A and as indicated.
  - .2 Trip rating: as indicated.
  - .3 Interrupting rating: 65 kA, rms symmetrical.

- .3 Solid-state tripping system consisting of 1 current sensor per pole, 1 solid-state trip unit and self-powered trip actuator. Equipped with long, short, instantaneous, ground fault, function and phase overload, ground fault indication.
- .4 Breakers stored energy, quick-make, closing mechanism at all nominal ratings.
- .5 Interlocks to prevent circuit breaker drawout when in closed position and to prevent closing unless fully engaged or in test position.
- .6 Start-stop indicator and indication of spring activated / release action.

## **2.02 OPTIONAL FEATURES**

- .1 Auxiliary switches: 2 N.O., 2 N.C.
- .2 Pilot light.
- .3 Control relay
- .4 Padlocking provision.
- .5 Integral metering for breakers 1 200 A and above.

## **2.03 MANUFACTURERS**

- .1 Schneider, EATON, Siemens.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install air circuit breakers as indicated.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 26 24 16.01 – Panelboards Breaker Type.

### **1.02 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

## **2 PRODUCTS**

### **2.01 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers, and Accessory high-fault protectors: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
- .5 Unless otherwise indicated, 120/208V, circuit breakers to have minimum 10 kA symmetrical rms interrupting capacity rating and 347/600V at 35 kA or as indicated.

## **2.02 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**

### **3.01 INSTALLATION**

- .1 Install circuit breakers as indicated.

**END OF SECTION**

## **1 GENERAL**

### **1.01 DISCONNECT SWITCHES – FUSED AND NON-FUSED**

- .1 Materials and fused and non-fused switches materials and their installation.

### **1.02 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3 Section 26 05 00 - Common Work Results for Electrical.

### **1.03 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.05 HEALTH AND SAFETY**

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

### **1.06 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.01 DISCONNECT SWITCHES**

- .1 Non-fusible, horsepower rated disconnect switch in CSA Enclosure 1 and CSA 4 in tunnels, to CAN/CSA C22.2 No.4 size as indicated.
- .2 Provision for padlocking in on-off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Quick-make, quick-break action.
- .5 ON-OFF switch position indication on switch enclosure cover.
- .6 Product : Square D, serie FS or approved EATON or Siemens equivalent.

### **2.02 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install disconnect switches complete.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED SECTIONS**

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

### **1.02 REFERENCES**

- .1 C22.2 no. 14-F95 (2001), Industrial Control Equipment.

### **1.03 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate:
  - .1 Mounting method and dimensions.
  - .2 Starter size and type.
  - .3 Layout of identified internal and front panel components.
  - .4 Enclosure types.
  - .5 Wiring diagram for each type of starter.
  - .6 Interconnection diagrams.

### **1.04 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Include operation and maintenance data for each type and style of starter.

### **1.05 EXTRA MATERIALS**

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

### **1.06 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Starters: to NEMA standard.

### **2.02 MANUAL MOTOR STARTERS**

- .1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
  - .1 Switching mechanism, quick make and break.
  - .2 One overload heater, manual reset, trip indicating handle.
- .2 Accessories:
  - .1 Toggle switch labelled as indicated.
  - .2 Indicating light: standard type and colour as indicated.
  - .3 Locking tab to permit padlocking in "ON" or "OFF" position.
- .3 Product : Square D, class 2510 or approuved equivalent.

### **2.03 FULL VOLTAGE MAGNETIC STARTERS**

- .1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
  - .1 Contactor solenoid operated, rapid action type.
  - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
  - .3 Wiring and schematic diagram inside starter enclosure in visible location.
  - .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:
  - .1 Locking in "OFF" position with up to 3 padlocks.
  - .2 Independent locking of enclosure door.
  - .3 Provision for preventing switching to "ON" position while enclosure door open.
- .3 Accessories:
  - .1 Pushbuttons, Selector switches : labelled as indicated.
  - .2 Indicating lights: standard type and color as indicated.
  - .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
  - .4 Product : Square D, class 8538 or approved equivalent.

### **2.04 CONTROL TRANSFORMER**

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

## **2.05 FINISHES**

- .1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results - Electrical.

## **2.06 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.
- .3 Magnetic starter designation label, white plate, black letters, size 4 engraved as indicated.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install starters, connect power and control as indicated.
- .2 Ensure correct fuses and overload devices elements installed.

### **3.02 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and manufacturer's instructions.
- .2 Operate switches, contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

**END OF SECTION**





## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN3-C13-M83(R1998), Instrument Transformers.
  - .2 CSA C22.2 No.178-1978(R2001), Automatic Transfer Switches.
- .2 American National Standards Institute (ANSI)/National Electrical Manufacturers Association (NEMA)
  - .1 ANSI/NEMA ICS 2-2000, Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

### **1.02 SYSTEM DESCRIPTION**

- .1 Automatic bypass load transfer equipment to:
  - .1 Monitor voltage on phases of normal power supply.
  - .2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below preset adjustable limits for adjustable period of time.
  - .3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.
  - .4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.
  - .5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.
- .2 A 1 000 kW/1250 kVA emergency generator has been supplied in a separate phase, coordinate transfer switch with existing generator as well with new 2500A switchboards.

### **1.03 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include:
  - .1 Make, model and type.
  - .2 Load classification:
    - .1 Tungsten lamp load: [\_\_\_\_\_] kW.
    - .2 Ballast lamp load: [\_\_\_\_\_] kW.
    - .3 Motor load: [\_\_\_\_\_] kW.
    - .4 Restricted use: resistance and general loads, 0.8pf or higher [\_\_\_\_\_] kW.
  - .3 Single line diagram showing controls and relays.
  - .4 Description of equipment operation including:
    - .1 Automatic starting and transfer to standby unit and back to normal power.
    - .2 Test control.
    - .3 Manual control.
    - .4 Automatic shutdown.

#### **1.04 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for automatic load transfer equipment for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Detailed instructions to permit effective operation, maintenance and repair.
- .3 Technical data:
  - .1 Schematic diagram of components, controls and relays.
  - .2 Illustrated parts lists with parts catalogue numbers.
  - .3 Certified copy of factory test results.

#### **1.05 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

### **2 PRODUCTS**

#### **2.01 MATERIALS**

- .1 Instrument transformers: to CAN3-C13.
- .2 Contactors: to ANSI/NEMA ICS2.

#### **2.02 CONTACTOR TYPE TRANSFER EQUIPMENT**

- .1 Contact Type Transfer Equipment: to CSA C22.2 No.178.
- .2 Two-single 3 phase contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, solenoid operated, open type with CSA 2 enclosure.
- .3 Rated: 347/600 V, 60Hz, 2 500 A. 4 wire, solid neutral.
- .4 Main contacts: silver surfaced, protected by arc disruption means.
- .5 Switch and relay contacts, coils, spring and control elements accessible for inspection and maintenance from front of panel without removal of switch panel or disconnection of drive linkages and power conductors.
- .6 Auxiliary contact: silver plated, to initiate emergency generator start-up on failure of normal power.
- .7 Fault withstand rating: 65 kA symmetrical for 3 cycles with maximum peak value of 90 kA.

- .8 Lever to operate switch manually when switch is isolated.
- .9 Solid neutral bar, rated: 2 500 A.
- .10 Overlapping neutral contacts on contactor type transfer equipment.
- .11 Switchable neutral pole on circuit breaker type equipment.

### 2.03 CONTROLS

- .1 Selector switch -four position "Test", "Auto", "Manual", "Engine start".
  - .1 Test position - Normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.
  - .2 Auto position - Normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.
  - .3 Manual position - Transfer switch may be operated by manual handle but transfer switch will not operate automatically and engine will not start.
  - .4 Engine start position - Engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.
- .2 Control transformers: dry type with 120V secondary to isolate control circuits from:
  - .1 Normal power supply.
  - .2 Emergency power supply.
- .3 Relays: continuous duty, industrial control type, with wiping action contacts rated 10 A minimum:
  - .1 Voltage sensing: 3 phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2V minimum undervoltage and over voltage protection.
  - .2 Time delay: normal power to standby, adjustable solid state, 5 to 180s.
  - .3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 3 to 20s delay.
  - .4 Time delay on retransfer from standby to normal power, adjustable 5 to 180s.
  - .5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 20s intervals to 10 min.
  - .6 Time delay during transfer to stop transfer action in neutral position to prevent fast transfer, adjustable, 5s intervals to 180s.
  - .7 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.
- .4 Solid state electronic in-phase monitor.

### 2.04 ACCESSORIES

- .1 Pilot lights to indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel and remote.
- .2 Plant exerciser: 168h timer to start standby unit once each week for selected interval transfers load to emergency supply and retransfers to normal supply on standby unit shutdown. Timer adjustable 0-168h in 15 min intervals.
- .3 Auxiliary relay to provide 4 N.O. and 4 N.C. contacts for remote alarms.

- .4 Instruments:
  - .1 Digital true rms, indicating type 2% accuracy, flush panel mounting:
    - .1 Voltmeter: ac, scale 0 to 1 000 V.
    - .2 Ammeter: ac, scale 0 to 2 500 A.
    - .3 Frequency meter: scale 55 to 65 Hz.
- .5 Voltmeter selector switch: rotary, maintained contacts, panel mounting type, round notched handle, four position, labelled "OFF-Phase A-Phase B-Phase C".
- .6 Potential transformers - dry type for indoor use:
  - .1 Ratio: 600 to 120.
  - .2 Rating: 600 V, 60Hz, BIL 10 kV.
  - .3 Accuracy rating: 0.3.
- .7 Ammeter selector switch: rotary, maintained contacts, panel mounting type, designed to prevent opening of current circuits, round notched handle, four position labelled "OFF - Phase A - Phase B - Phase C".
- .8 Current transformers - dry type for indoor use:
  - .1 Ratio: 2 500 to 5.
  - .2 Rating: 600 V, 60Hz, BIL 10 kV.
  - .3 Accuracy rating: 0.3.
  - .4 Positive action automatic short- circuiting device in secondary terminals.
- .9 Manual bypass: to isolate and bypass automatic operation.

## 2.05 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Control panel:
  - .1 For selector switch and manual switch: size 4 nameplates.
  - .2 For meters, indicating lights, minor controls: size 2 nameplates.

## 2.06 SOURCE QUALITY CONTROL

- .1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Departmental Representative.
- .2 Notify Departmental Representative days in advance of date of factory test.
- .3 Tests:
  - .1 Operate equipment both mechanically and electrically to ensure proper performance.
  - .2 Check selector switch, in modes of operation Test, Auto, Manual, Engine Start and record results.
  - .3 Check voltage sensing and time delay relay settings.
  - .4 Check:
    - .1 Automatic starting and transfer of load on failure of normal power.
    - .2 Retransfer of load when normal power supply resumed.
    - .3 Automatic shutdown.
    - .4 In-phase monitor operation.

### **3 EXECUTION**

#### **3.01 INSTALLATION**

- .1 Locate, install and connect transfer equipment.
- .2 Check relays solid state monitors and adjust as required.
- .3 Install and connect battery and remote alarms.

#### **3.02 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results – Electrical.
- .2 Energize transfer equipment from normal power supply.
- .3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.
- .4 Set selector switch in "Manual" position and check to ensure proper performance.
- .5 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.
- .6 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 min, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.
- .7 Repeat, at 1h intervals, 2 times, complete test with selector switch in each position, for each test.
- .8 Coordinate commissioning of automate transfer switch with contractor who has supplied the new generator in previous phase.

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C82.1-04, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE )
  - .1 ANSI/IEEE C62.41-1991, Surge Voltages in Low-Voltage AC Power Circuits.
- .3 American Society for Testing and Materials (ASTM)
  - .1 ASTM F 1137-00(2006), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA)/CSA International.
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters Laboratories of Canada (ULC).

### **1.02 RELATED SECTIONS**

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

### **1.03 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
- .3 Photometric data to include: VCP Table.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Disposal of fluorescent lamps.

- .5 Disposal of old PCB filled ballasts (if still existing) on renovation jobs.

## **2 PRODUCTS**

### **2.01 LAMPS**

- .1 DE1: 1W, color temperature 2 700K, or as indicated.
- .2 Fluorescent : T8, 32W, medium twin base sockets instant start, color temperature 4 100 K, 2 800 lumens, color index 85, 25 000 hours, or as indicated Philipps Alto.

### **2.02 BALLASTS**

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
  - .1 Rating: 120 V, 60 Hz, for use with 2-32W, rapid start lamps.
  - .2 RFI/EMI suppression circuit to: FCC (CFR47) Part 18, sub-part C, Class A and Part 15, sub-part B, Class B.
  - .3 Totally encased and designed for 40°C ambient temperature.
  - .4 Power factor: minimum 95 % with 95% of rated lamp lumens.
  - .5 Crest factor: 1.5 maximum current.
  - .6 Harmonics: 10 % maximum THD.
  - .7 Sound rated: Class A.
  - .8 Mounting: integral with luminaire.

### **2.03 FINISHES**

- .1 Finish and construction of lighting fixtures shall be CSA Certified for usage.

### **2.04 LIGHT CONTROL DEVICES**

- .1 As indicated, see lighting fixture schedule.

### **2.05 LUMINAIRES**

- .1 As indicated, see lighting fixture schedule.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Locate and install luminaires as indicated.
- .2 Support luminaires adequately with supports and brackets suitable for ceiling system.

### **3.02 WIRING**

- .1 Connect luminaires to lighting circuits:
  - .1 Install wiring in rigid or flexible conduit, as indicated.



**3.03 LUMINAIRE SUPPORTS**

- .1 For suspended ceiling installations support luminaires from ceiling grid in accordance with local inspection requirements.

**3.04 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

**END OF SECTION**



## **1 GENERAL**

### **1.01 UNIT EQUIPMENT FOR EMERGENCY LIGHTING**

- .1 Materials and installation for emergency lighting systems.

### **1.02 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 26 05 21 - Wires and Cables (0-1000 V).
- .4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .5 Section 26 53 00 – Exit signs.

### **1.03 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.141-M1985(R1999), Unit Equipment fo Emergency Lighting.

### **1.04 SUBMITTALS**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data to indicate system components, mounting method, source of power and special attachments.

### **1.05 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Dispose of unused batteries at official hazardous material collections site approved by Departmental Representative.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

## **1.06 WARRANTY**

- .1 For batteries, 120 months warranty period, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years.

## **2 PRODUCTS**

### **2.01 EQUIPMENT**

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, ac.
- .3 Output voltage: 12 V dc.
- .4 Operating time: 60 min.
- .5 Battery: sealed, maintenance free.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON'.
- .10 Lamp heads: integral on unit, 360 degrees horizontal and 180 degrees vertical adjustment with Lamp.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Finish: White.
- .13 Auxiliary equipment:
  - .1 Test switch.
  - .2 Time delay relay.
  - .3 Battery disconnect device.
  - .4 AC input and DC output terminal blocks inside cabinet.
  - .5 Shelf.
  - .6 Cord and single twist-lock plug connection for AC or direct connection as indicated.
  - .7 RFI suppressors.

### **2.02 WIRING OF REMOTE HEADS**

- .1 Conduit: type EMT, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and

Conduit Fittings.

- .2 Conductors: RW90 type in accordance with Section 26 05 21 - Wires and Cables 0-1000 V, sized in accordance with manufacturer's recommendations.

### **3 EXECUTION**

#### **3.01 INSTALLATION**

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.141-02, Unit Equipment for Emergency Lighting.
  - .2 CSA C860-01(December 2002), Performance of Internally-Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
  - .1 NFPA 101-2006, Life Safety Code.

### **1.02 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.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
  - .1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

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

## **2 PRODUCTS**

### **2.01 STANDARD UNITS**

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: cold rolled steel minimum 1.0 mm thick, satin aluminum enamel finish.
- .3 Face and back plates: die formed cold rolled steel.
- .4 Lamp : LED , 120VAC and 12VDC, minimum 50 000 hours rating.
- .5 As indicated, see lighting fixture schedule.
- .6 Letters: 150 mm high x 19 mm, with 13 mm thick stroke, red on white glass, reading EXIT and SORTIE.

- .7 Downlight: translucent acrylic in bottom of unit.
- .8 Face plate to remain captive for relamping.

## **2.02 DESIGN**

- .1 Wall mounting, as indicated.
- .2 Single face with die-cast face plate to remain captive for relamping, as indicated.
- .3 As indicated, see lighting fixture schedule.

## **3 EXECUTION**

### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

### **3.02 INSTALLATION**

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.

### **3.03 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**

### **1.01 REFERENCES**

- .1 ASTM International
  - .1 ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m<sup>3</sup>.
- .2 CSA International
  - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA A3000-08, Cementitious Materials Compendium.
- .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.

### **1.02 ADMINISTRATIVE REQUIREMENTS**

- .1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work.
  - .1 Pay costs of relocating services.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples: submit to designated testing agency, 23 kg sample of backfill for fill unshrinkable fill material proposed for use, no later than 1 week before backfilling or filling work.
- .3 Site Quality Control Submittals: submit in accordance with Section 01 45 00 - Quality Control.
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article.
  - .2 Submit testing results and report as described in PART 3 - FIELD QUALITY CONTROL.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Crushed Granular 20-0 to OPSS 1010 and Sand to OPSS 1004.

### **3 EXECUTION**

#### **3.01 EXAMINATION**

- .1 Evaluation and Assessment:
  - .1 Examine soil report prepared by Inspecsol report no. M032069-A2 dated April 16th 2014 and is enclosed in tender document.
  - .2 Before commencing work verify and establish locations of buried services on and adjacent to site.

#### **3.02 PREPARATION**

- .1 Temporary erosion and sedimentation control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during 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 directives.
  - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
  - .5 Protect buried services that are required to remain undisturbed.
- .3 Removal:
  - .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
  - .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

#### **3.03 EXCAVATION**

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations.
- .2 Perform blasting in accordance with Provincial and Municipal regulations: repair damage as authorized by Departmental Representative.
  - .1 Do not blast within 3 m of building and where damage would result.
- .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.

- .1 Stockpile topsoil on site for later use.
- .4 Excavate as required to carry out work.
  - .1 Do not disturb soil or rock below bearing surfaces.
  - .2 Notify Departmental Representative when excavations are complete.
  - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
  - .4 Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .5 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
  - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .6 Excavate for slabs and paving to subgrade levels.
  - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

### **3.04 FIELD QUALITY CONTROL**

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Departmental Representative.
- .2 Not later than 1 week minimum before backfilling or filling, submit to designated testing agency, samples of backfill as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative to allow compaction tests to be carried out by designated testing agency.

### **3.05 BACKFILLING**

- .1 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .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 fill.
  - .1 Fill excavated areas with selected subgrade material compacted as specified for fill.
- .4 Placing:
  - .1 Place backfill, fill and base course 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 D 698:
  - .1 To underside of base courses: 95%.
  - .2 Base courses: 95%.
  - .3 Elsewhere: 90%.
- .6 Under slabs and paving:
  - .1 Use excavated material up to bottom of granular base courses.
  - .2 Use crushed stone MG-20 for base courses.
- .7 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.
- .8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .9 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material
- .10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

### 3.06 GRADING

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

### 3.07 CLEANING

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

### **1.01 REFERENCES**

- .1 ASTM International
  - .1 ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m<sup>3</sup>.
- .2 CSA International
  - .1 CSA A23.1/A23.2- 09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Granular A conform to OPSS SP 110F13 and Sand to OPSS 1004.

## **3 EXECUTION**

### **3.01 EXAMINATION**

- .1 Verification of Conditions:
  - .1 Examine soil report prepared by Inspecsol report no.M032069-A2 dated April 16<sup>th</sup> 2014 and is enclosed in tender documents.
  - .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 Testing of materials and compaction of backfill will be carried out by testing laboratory designated by Departmental Representative.
  - .3 Not later than 1 week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill fill material proposed for use.
  - .4 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.
  - .5 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.

### 3.02 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.
  - .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 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.
  - .2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
  - .3 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
  - .4 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
  - .5 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.

### 3.03 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 Strip topsoil to depths as directed by Departmental Representative. 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 Stockpile in locations as directed by Departmental Representative.
  - .5 Dispose of topsoil to location as directed by Departmental Representative 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.

### **3.04 SITE QUALITY CONTROL**

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

### **3.05 BACKFILLING**

- .1 Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from Departmental Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with selected subgrade material compacted as specified for fill.
- .5 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.
- .6 Compaction: compact each layer of material to following densities for material to ASTM D 698:
  - .1 To underside of basecourses: 95%.
  - .2 Basecourses: 95%.
  - .3 Elsewhere: 90%.
- .7 Under slabs and paving:
  - .1 Use site excavated material up to bottom of granular base courses.
  - .2 Use crushed stone MG-20 for base courses.
- .8 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.
- .9 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

### **3.06 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.

### **3.07 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

### 1.01 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 127-04, Standard Test Method for Density, Relative Density and Absorption of Coarse Aggregate.
  - .2 ASTM D 698-00a1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600 kN-m/m<sup>3</sup>.
  - .3 ASTM D 1557-02e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700 kN-m/m<sup>3</sup>.
  - .4 ASTM D 4253-00, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

### 1.02 DEFINITIONS

- .1 Corrected maximum dry density is defined as:
  - .1  $D = (D1 \times D2) / ((F1 \times D2) + (F2 \times D1))$
  - .2  $D = (F1 \times D1) + (0.9 \times D2 \times F2)$
  - .3 Where: D = corrected maximum dry density kg/m<sup>3</sup>.
    - .1 F1 = fraction (decimal) of total field sample passing 19 mm sieve
    - .2 F2 = fraction (decimal) of total field sample retained on 4.75 mm sieve (equal to 1.00 - F1)
    - .3 D1 = maximum dry density, kg/m<sup>3</sup> of material passing 4.75 mm sieve determined in accordance with Method A of ASTM D 698.
    - .4 D2 = bulk density, kg/m<sup>3</sup>, of material retained on 19 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C 127.
- .4 For free draining aggregates, determine D1 (maximum dry density) to ASTM D 4253 dry method when directed by Departmental Representative.

## 2 PRODUCTS

### 2.01 NOT USED

- .1 Not Used.

## 3 EXECUTION

### 3.01 NOT USED

- .1 Not Used.

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D 4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

### **1.02 SAMPLES**

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

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert unused granular materials from landfill to local quarry as approved by Departmental Representative.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Natural sand.
  - .2 Manufactured sand.
  - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.

## **2.02 SOURCE QUALITY CONTROL**

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

## **3 EXECUTION**

### **3.01 PREPARATION**

- .1 Topsoil stripping
  - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
  - .2 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of weeds and grasses and removed from site.
  - .3 Strip topsoil to depths as directed by Departmental Representative. Avoid mixing topsoil with subsoil.
  - .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
  - .5 Dispose of topsoil as directed by Departmental Representative off site.
- .2 Aggregate source preparation
  - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by Departmental Representative approved by authority having jurisdiction.
  - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
  - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
  - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
  - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
- .3 Processing
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Departmental Representative.

- .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Departmental Representative.
- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.
- .4 Handling
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .5 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 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 h of rejection.
  - .7 Stockpile materials in uniform layers of thickness as follows:
    - .1 Max 1.5 m for coarse aggregate and base course materials.
    - .2 Max 1.5 m for fine aggregate and sub-base materials.
    - .3 Max 1.5 m for other materials.
  - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .9 Do not cone piles or spill material over edges of piles.
  - .10 Do not use conveying stackers.
  - .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### 3.02 CLEANING

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

**END OF SECTION**



## 1 GENERAL

### 1.01 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 422-632002, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D 698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600 kN-m/m<sup>3</sup>.
  - .5 ASTM D 1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700 kN-m/m<sup>3</sup>.
  - .6 ASTM D 4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

### 1.02 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock : solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 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 D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
- .2 Table:
- | <u>Sieve Designation</u> | <u>% Passing</u> |
|--------------------------|------------------|
| 2.00 mm                  | 100              |
| 0.10 mm                  | 45 - 100         |
| 0.02 mm                  | 10 - 80          |
| <u>0.005 mm</u>          | <u>0 - 45</u>    |
- .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

### 1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 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.
- .2 Preconstruction Submittals:
- .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
- .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field ,relocated and abandoned services, as required].
- .3 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 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.
- .5 At least 4 weeks prior to beginning Work, inform Departmental Representative source of fly ash and submit samples to Departmental Representative.
  - .1 Do not change source of Fly Ash without written approval of Departmental Representative.

#### **1.04 QUALITY ASSURANCE**

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where Departmental Representative is employee of Contractor, submit proof that Work by Departmental Representative is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Quebec, Canada.
- .5 Keep design and supporting data on site.
- .6 Engage services of qualified professional Engineer who is registered or licensed in Quebec, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .8 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.05 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert excess aggregate materials from landfill to local quarry recycling facility for reuse as directed by Departmental Representative.

#### **1.06 EXISTING CONDITIONS**

- .1 Examine soil report prepared by Inspecsol report no.M032069-A2 dated April 16<sup>th</sup> 2014 and is enclosed in the tender document.
- .2 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

- .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to beginning excavation Work, notify Departmental Representative to establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.
  - .6 Confirm locations of buried utilities by careful test excavations soil hydrovac methods.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
  - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing. Costs for such Work to be paid by Departmental Representative.
  - .9 Record location of maintained, re-routed and abandoned underground lines.
  - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
- .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative and in accordance with Section 32 01 90.33 - Tree and Shrub Preservation.

## 2 PRODUCTS

### 2.01 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:

- .1 Crushed screened stone or sand.
- .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117 . Sieve sizes to CAN/CGSB-8.1 .

- .3 Table:

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

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

### **3 EXECUTION**

#### **3.01 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

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

#### **3.02 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 in accordance with Section 02 41 13 - Selective Site Demolition.

#### **3.03 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

#### **3.04 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of weeds and 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 directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.

- .4 Dispose of unused topsoil as directed by Departmental Representative off site.

### **3.05 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.

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

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements Health and Safety Act for the Province of Quebec.
  - .1 Where conditions are unstable, Departmental Representative to verify and advise methods.
- .2 Construct temporary Works to depths, heights and locations approved by Departmental Representative.
- .3 During backfill operation:
  - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
  - .1 Remove cofferdams, shoring and bracing.
  - .2 Remove excess materials from site and restore watercourses as indicated and as directed by Departmental Representative.

### **3.07 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative 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.

- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved collection runoff areas in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### 3.08 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as directed by Departmental Representative.
- .3 Remove concrete and paving walks and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 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.
- .6 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 trench at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material off site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Obtain Departmental Representative approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .15 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces and footings with Type 2 fill compacted to not less than 90% of corrected Standard Proctor maximum dry density in accordance with Section 31 05 10 - Corrected Maximum Dry Density for Fill.

- .2 Fill under other areas with Type 2 fill compacted to not less than 90 % of corrected Standard Proctor maximum dry density in accordance with Section 31 05 10 - Corrected Maximum Dry density fir Fill.
- .16 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.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

### 3.09 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698 in accordance with Section 31 05 10 - Corrected Maximum Dry Density for Fill.
  - .1 Exterior side of perimeter walls: use Type 2 fill to subgrade level. Compact to 90% of corrected maximum dry density.
  - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 90 % of corrected maximum dry density.
  - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 95 %.
  - .4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95 %. For remaining portion, use Type 3 fill compacted to 90%.

### 3.10 BACKFILLING

- .1 Vibratory compaction equipment to be approved.
- .2 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.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place 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 0.5 m.

- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
  - .1 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

### **3.11 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as directed by Departmental Representative.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**





## **1 GENERAL**

### **1.01 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for fertilizing and preserving root systems of plants affected by changing grades or excavation.

### **1.02 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA G30.5-M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
- .2 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .2 Fertilizers Act (R.S. 1985, c. F-10).
  - .3 Fertilizers Regulations (C.R.C., c. 666).
  - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .3 Health Canada - Pest Management Regulatory Agency (PMRA).
  - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

### **1.03 DEFINITIONS**

- .1 Mycorrhiza : association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Contractor's responsibility.
- .3 Submit WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.
- .4 Coordinate submittal requirements and provide submittals required by Section 01 47 15 - Sustainable Requirements: Construction.

## **1.05 QUALITY ASSURANCE**

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Sustainable Requirements:
  - .1 Construction requirements: in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
  - .2 Verification: contractor's verification in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

## **1.06 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Collect and separate for disposal paper, plastic and packaging material for recycling in accordance with Waste Management Plan.
  - .4 Separate for recycling and place in designated containers Plastic waste in accordance with Waste Management Plan.
  - .5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
  - .6 Divert unused wood materials from landfill by alternative disposal approved by Departmental Representative.
  - .7 Divert unused stone and aggregate materials from landfill to local facility approved by Departmental Representative.
  - .8 Divert unused plastic materials from landfill to local recycling facility approved by Departmental Representative.
  - .9 Place materials defined as hazardous or toxic in designated containers.
  - .10 Dispose of unused fertilizer material at official hazardous material collections site approved by Departmental Representative.
  - .11 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
  - .12 Do not dispose of unused fertilizer material into sewer system, into streams, lakes, onto ground or in any other location where they will pose health or environmental hazard.
  - .13 Ensure emptied containers are sealed and stored safely.
  - .14 Fold up metal banding, flatten and place in designated area for recycling.

## **1.07 SCHEDULING**

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

## **1.08 MAINTENANCE DURING WARRANTY PERIOD**

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
  - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
  - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative prior to application.
  - .3 Apply fertilizer in early spring at rate of 0.025 kg of nitrogen/m<sup>2</sup> at manufacturer's suggested rate.
  - .4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through alternative disposal composting mulching.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Fill:
  - .1 Type B: excavated pervious soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Departmental Representative before use as fill.
- .2 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded minimum particle size: 5 mm.
- .3 Fertilizer:
  - .1 To Canada Fertilizer Act and Fertilizers Regulations.
  - .2 Complete, commercial, slow release with 35 % of nitrogen content in water-insoluble form.

## **3 EXECUTION**

### **3.01 IDENTIFICATION AND PROTECTION**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.
- .3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

- .4 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

### 3.02 ROOT CURTAIN SYSTEM

- .1 Identify limits for required construction excavation as approved by Departmental Representative.
- .2 Prior to construction excavation, hand dig trench minimum 500 mm wide x 1500 mm deep, along perimeter of excavation limits.
- .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
- .4 Securely attach Type 2 filter fabric on plant side of wire mesh.
- .5 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
  - .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
  - .2 Incorporate with mixture grade 2:12:8 ratio fertilizer dry at rate of 1.5 kg/m<sup>3</sup>.
- .6 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.
- .7 Protect root curtain from damage during construction operations.
- .8 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
- .9 Protect root curtain before during backfill operations. Ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

### 3.03 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

- .1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.
- .4 Minimum acceptable depth to top of tunnel: 1000 mm.
- .5 Backfill for tunnel and trench to 90% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

### **3.04 LOWERING GRADE AROUND EXISTING TREE**

- .1 Begin Work in accordance with schedule approved by Departmental Representative.
- .2 Cut slope not less than 500 mm from tree trunk to new grade level.
- .3 Excavate to depths as indicated. Protect from damage root zone which is to remain.
- .4 When severing roots at excavation level, cut roots with sharp tools.
- .5 Cultivate excavated surface manually to 15 mm depth.
- .6 Prepare homogeneous soil mixture consisting by volume of:
  - .1 60 % excavated soil cleaned of roots, plant matter, stones, debris.
  - .2 25 % coarse, clean sterile sand.
  - .3 15 % organic matter.
  - .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m<sup>3</sup>.
- .7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.
- .8 Water entire root zone to optimum soil moisture level.
- .9 Install surface cover of sodding in accordance with Section 32 92 23 - Sodding.

### **3.05 PRUNING**

- .1 Prune trees and bushes.
- .2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through alternative disposal.

**END OF SECTION**



## **1 GENERAL**

### **1.01 MEASUREMENT PROCEDURES**

- .1 Granular sub-base of material incorporated into Work and accepted by Departmental Representative not to be measured.

### **1.02 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C 117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D 422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.
  - .5 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m<sup>3</sup>.
  - .6 ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700kN-m/m<sup>3</sup>.
  - .7 ASTM D 1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .8 ASTM D 4318-00, 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.

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Divert unused granular material from landfill to local quarry as approved by Departmental Representative.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Granular sub-base material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Crushed screened stone or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.
  - .3 Table

| Sieve Designation | % Passing |       |      |        |
|-------------------|-----------|-------|------|--------|
| 100 mm            | -         | -     | -    | -      |
| 75 mm             | 100       | 100   | 100  | -      |
| 50 mm             | -         | -     | -    | 100    |
| 37.5 mm           | -         | -     | -    | -      |
| 25 mm             | 55-100    | -     | -    | 60-100 |
| 19 mm             | -         | -     | -    | -      |
| 12.5 mm           | -         | -     | -    | 38-70  |
| 9.5 mm            | -         | -     | -    | -      |
| 4.75 mm           | 25-100    | 25-85 | -    | 22-55  |
| 2.00 mm           | 15-80     | -     | -    | 13-42  |
| 0.425 mm          | 4-50      | 5-30  | 0-30 | 5-28   |
| 0.180 mm          | -         | -     | -    | -      |
| 0.075 mm          | 0-8       | 0-10  | 0-8  | 2-10   |

.4 Other Properties as follows:

- .1 Liquid Limit: to ASTM D 4318, Maximum 25.
- .2 Plasticity Index: to ASTM D 4318, Maximum 6.
- .3 Los Angeles degradation: to ASTM C 131. Max% Loss by mass: 40.
- .4 Particles smaller than 0.02 mm: to ASTM D 422, Maximum 3%.
- .5 Soaked CBR: to ASTM D 1883, Min 40 when compacted to 100% of ASTM D 1557.

### 3 EXECUTION

#### 3.01 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. Departmental Representative may authorize thicker lifts (layers) 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.

### **3.02 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 before use.
- .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 D 698.
- .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.

### **3.03 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 approval from Departmental Representative to use non standard proof rolling equipment.
- .3 Proof roll at level in sub-base as indicated. If non standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 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 and compact in accordance with sub-base material and compact in accordance with this section.
  - .3 Replace sub-base material and compact.
- .6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

**3.04 SITE TOLERANCES**

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

**3.05 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**

### **1.01 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600 kN-m/m<sup>3</sup>.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.5-M91(March 1999), Low Flash Petroleum Spirits Thinner (Reaffirmation of December 1991).
  - .
- .3 Government of Québec, Minister of Transport
  - .1 Cahier des charges et devis généraux (CCDG)-2009.

### **1.02 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative, samples of material for sieve analysis at least two weeks before beginning Work.

### **1.03 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal plastic packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Divert unused aggregate materials from landfill to quarry for reuse as approved by Departmental Representative.
- .6 Divert unused asphalt from landfill to facility capable of recycling materials.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Aggregates to: CCDG.
  - .1 Crushed Granular MG 20.
- .2 Asphalt concrete: to CCDG

- .3 Granular base: MG 20
- .4 Asphalt concrete: to EB-14S.

### **3 EXECUTION**

#### **3.01 FOUNDATIONS**

- .1 Foundations for roadways comprise:
  - .1 300 mm compacted thickness of granular base MG 20.
- .2 Construction of granular foundations: to CCDG.
- .3 Compaction: compact each lift of granular material to 95% maximum density to ASTM D 698. Maximum lift thickness: 150 mm.

#### **3.02 PAVEMENT THICKNESS**

- .1 Pavements for roadways:
  - .2 Wear course: 50 mm EB-14S.

#### **3.03 PAVEMENT CONSTRUCTION**

- .1 Construction of asphalt concrete: to CCDG.

**END OF SECTION**

## 1 GENERAL

### 1.01 MEASUREMENT PROCEDURES

- .1 Asphalt concrete pavement including granular base will be measured in square metres of asphalt surface in place.

### 1.02 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM C 88-99a, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
  - .2 ASTM C 117-95, Standard Test Method for Material Finer Than 0.075 (No. 200) mm Sieve in Mineral Aggregates by Washing.
  - .3 ASTM C 123-98, Standard Test Method for Lightweight Particles in Aggregate.
  - .4 ASTM C 127-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
  - .5 ASTM C 128-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
  - .6 ASTM C 131-01, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .7 ASTM C 136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .8 ASTM D 698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 600 kN-m/m<sup>3</sup>.
  - .9 ASTM D 995-95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
  - .10 ASTM D 1557-00, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700 kN-m/m<sup>3</sup>.
  - .11 ASTM D 2419-02, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
  - .12 ASTM D 3203-94(2000), Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
  - .13 ASTM D 4318-00, Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
  - .14 ASTM D 4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Asphalt Institute (AI)
  - .1 AI MS-2-1993 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- .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.
  - .3 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
  - .4 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
  - .5 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for review.
- .3 Materials to be tested by independent testing laboratory.
- .4 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.
- .5 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .6 Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing work.
- .7 Submit samples of following materials proposed for use at least 4 weeks prior to commencing work:
  - .1 One 5 L container of asphalt cement.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal plastic packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused asphalt materials from landfill to local quarry as approved by Departmental Representative.
- .5 Divert unused aggregate materials from landfill to quarry for reuse as approved by Departmental Representative.
- .6 Unused protective coating material must be disposed of at an official hazardous material collections site as approved by Departmental Representative.
- .7 Unused protective coating material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Granular base material: to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Crushed screened stonel or sand.
  - .2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.3 Table

| Sieve Designation | Granular Base |        | Granular Sub-Base |      |
|-------------------|---------------|--------|-------------------|------|
| 200 mm            | -             | -      | -                 | -    |
| 75 mm             | -             | -      | 100               | 100  |
| 50 mm             | 100           | -      | -                 | -    |
| 38.1 mm           | 70-100        | -      | -                 | -    |
| 25 mm             | -             | -      | 55-100            | -    |
| 19 mm             | 50-75         | 100    | -                 | -    |
| 12.5 mm           | -             | 70-100 | -                 | -    |
| 9.5 mm            | 40-65         | -      | -                 | -    |
| 4.75 mm           | 30-50         | 40-70  | 25-100            | -    |
| 2.00 mm           | -             | 23-50  | 15-80             | -    |
| 0.425 mm          | 10-30         | 7-25   | 4-50              | 0-30 |
| 0.180 mm          | -             | -      | -                 | -    |
| 0.075 mm          | 3-8           | 3-8    | 0-8               | 0-8  |

.4 Granular base aggregates:

- .1 Crushed particles: at least 60 % of particles by mass retained on 4.75 mm sieve to have at least 1 freshly fractured face.
- .2 Liquid limit: to ASTM D 4318, maximum 25.
- .3 Plasticity index: to ASTM D 4318, maximum 6.

.2 Asphalt concrete aggregates:

- .1 Coarse aggregate is aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C 117.
- .2 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.
- .3 Separate stock piles for coarse and fine aggregate are not required for sheet asphalt.
- .4 Do not use aggregates having known polishing characteristics in mixes for surface courses.
- .5 Aggregate: material to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Crushed stone or gravel.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1, CAN/CGSB-8.2.

.3 Table

| Sieve Designation | % Passing        |               |
|-------------------|------------------|---------------|
|                   | Asphalt Concrete | Sheet Asphalt |
| 200 mm            | -                | -             |
| 75 mm             | -                | -             |
| 50 mm             | -                | -             |
| 38.1 mm           | -                | -             |
| 25 mm             | -                | -             |
| 19.0 mm           | 100              | -             |
| 12.5              | -                | 100           |
| 9.5 mm            | 60-80            | 100           |
| 4.75 mm           | 40-65            | 85-100        |
| 2.00 mm           | 30-50            | 80-95         |

|          |       |       |
|----------|-------|-------|
| 0.425 mm | 15-30 | 40-70 |
| 0.180 mm | 5-20  | 10-35 |
| 0.075 mm | 3-8   | 4-14  |

- .4 Sand equivalent: to ASTM D 2419, Minimum 50.
- .5 Magnesium Sulphate soundness: to ASTM C 88. Max % loss by weight: coarse aggregate 12, fine aggregate 16.
- .6 Los Angeles Degradation: to ASTM C 131. Max % loss by weight: coarse aggregate, 35.
- .7 Absorption: to ASTM C 127. Max % by weight: coarse aggregate, 1.75.
- .8 Lightweight particles: to ASTM C 123 . Max % by mass, with less than 1.95. Relative density (formally Specific Gravity): 1.5.
- .9 Flat and elongated particles: to ASTM D 4791, (with length to thickness ratio greater than 5): Max % by weight: coarse aggregate, 15.
- .10 Crushed particles: at least 60 % of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C 136.
- .11 Table
 

| <u>Passing</u> |    | <u>Retained on</u> |
|----------------|----|--------------------|
| 19 mm          | to | 9.5 mm             |
| 9.5 mm         | to | 4.75 mm            |
- .12 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

- .3 Mineral filler for asphalt concrete:
  - .1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
  - .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed by Departmental Representative to improve mix properties.
- .4 Asphalt cement: to CAN/CGSB-16.3.
- .5 Asphalt tack coat: to CAN/CGSB-16.2, grade SS-1.

## 2.02 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers for parking lots and driveways:
  - .1 Minimum drum diameter: 750 mm.
  - .2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.
- .4 Haul trucks: of sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
  - .1 Boxes with tight metal bottoms.



- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .5 Suitable hand tools.

## 2.03 MIX DESIGN

- .1 Mix design to AI MS-2.
- .2 Job mix formula to be approved by Departmental Representative.
- .3 Design of mix: by Marshall method to requirements below:
  - .1 Compaction blows on each face of test specimens: 50.
  - .2 Mix physical requirements:
 

| Property                               | Sheet Asphalt | Concrete |
|--|---------------|----------|
| Marshall                               | 3.0           | 5.5      |
| Stability at 60 degrees C, kN minimum. |               |          |
| Flow Value, mm.                        | 2-5           | 2-4      |
| Air Voids in Mixture, %                | 3-5           | 3-5      |
| Voids in Mineral Aggregate, % minimum  | 16            | 15       |
| Index of Retained Stability, % minimum | 75            | 75       |
  - .3 Measure physical requirements as follows:
    - .1 Marshall load and flow value: to ASTM D 1559.
    - .2 Compute void properties on basis of bulk specific gravity of aggregate to ASTM C 127 and ASTM C 128. Make allowance for volume of asphalt absorbed into pores of aggregate.
    - .3 Air voids: to ASTM D 3203.
    - .4 Voids in mineral aggregate: to AI MS-2, chapter 4.
    - .5 Index of Retained Stability: measure in accordance with Section 32 12 10 - Marshall Immersion Test for Bitumen.
- .4 Do not change job-mix without prior approval of Departmental Representative. When change in material source proposed, new job-mix formula will be reviewed by Departmental Representative.
- .5 Return plant dust collected during processing to mix in quantities acceptable to Departmental Representative.

### **3 EXECUTION**

#### **3.01 SURFACE PREPARATION AND INSPECTION**

- .1 Verify grades of subgrade in paving area for conformity with elevations and sections before placing granular base material.
- .2 Obtain approval of subgrade by Departmental Representative before placing base granular.

#### **3.02 GRANULAR BASE**

- .1 Place granular base material on clean unfrozen surface, free from snow and ice.
- .2 Place granular base to compacted thicknesses as indicated. Do not place frozen material.
- .3 Place in layers not exceeding 150 mm compacted thickness. Compact to density not less than 95 % corrected maximum dry density with ASTM D 698.
- .4 Finished base surface to be within 10 mm of specified grade, but not uniformly high or low.

#### **3.03 PLANT AND MIXING REQUIREMENTS**

- .1 In accordance with ASTM D 995.

#### **3.04 ASPHALT CONCRETE PAVING**

- .1 Obtain approval of base and primer from Departmental Representative before placing asphalt mix.
- .2 Place asphalt mix only when base or previous course is dry and air temperature is above 5 degrees C.
- .3 Place asphalt concrete in compacted layers not exceeding 50 mm in one lift.
- .4 Minimum 135 degrees C mix temperature required when spreading.
- .5 Maximum 160 degrees C mix temperature permitted at any time.
- .6 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.
- .7 Compact parking lot and driveway asphalt concrete to density not less than 98 % of density obtained with Marshall specimens prepared in accordance with ASTM D 1559 from samples of mix being used. Roll until roller marks are eliminated.
- .8 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.
- .9 Moisten roller wheels with water to prevent pick up of material.
- .10 Compact mix with hot tampers or other equipment approved by Departmental Representative, in areas inaccessible to roller.

- .11 Finish surface to be within 10 mm of design elevation and with no irregularities greater than 10 mm in 4.5 m.
- .12 Repair areas showing checking, rippling or segregation as directed by Departmental Representative.

### **3.05 JOINTS**

- .1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
- .2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .3 For cold joints, cut back to full depth vertical face and tack face with hot asphalt.
- .4 For longitudinal joints, overlap previously laid strip with spreader by 25 to 50 mm.
- .5 Curve curbs uniformly.

### **3.06 TESTING**

- .1 Inspection and testing of asphalt pavement will be carried out by designated testing laboratory in accordance with Section 01 45 00 - Quality Control.
- .2 Costs of tests will be paid by owner.

### **3.7 PROTECTION**

- .1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38 degrees C. Do not permit stationary loads on pavement until 24 hours after placement.
- .2 Provide access to buildings as required. Arrange paving schedule so as not to interfere with normal use of premises.

**END OF SECTION**



## **1 GENERAL**

### **1.01 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 117-04, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 260-86(2001), Standard Specification for Boiled Linseed Oil.
  - .4 ASTM D 698-00ae1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 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.

### **1.02 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.
- .3 If materials have been tested by testing laboratory approved by Departmental Representative within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

### **1.03 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 47 21 - Construction/Demolition Waste Management and Disposal.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcing.

- .3 Joint filler and Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .4 Granular base: material to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Type 1 fill.
  - .2 Crushed stone .
  - .3 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
- .5 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.
- .6 Fill material: to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Type 1 fill.
  - .2 Crushed stone.
  - .3 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
- .7 Boiled linseed oil: to ASTM D 260.
- .8 Kerosene: to CAN/CGSB-3.3.

### **3 EXECUTION**

#### **3.01 GRADE PREPARATION**

- .1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Place fill in maximum 150 mm layers and compact to at least 95% of maximum dry density to ASTM D 698.

#### **3.02 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 D 698.

#### **3.03 CONCRETE**

- .1 Obtain Departmental Representative approval of granular base and reinforcing steel 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.

### **3.04 TOLERANCES**

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

### **3.05 EXPANSION AND CONTRACTION JOINTS**

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 1.5 m.
- .2 Install expansion joints as directed by Departmental Representative at intervals of 6 m.
- .3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

### **3.06 ISOLATION JOINTS**

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

### **3.07 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.

### **3.08 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 directed by Departmental Representative.

### **3.9 CLEANING**

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

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

**END OF SECTION**



**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 32 92 23 sodding.

**1.2                REFERENCE**

- .1            BNQ 0605-100 – Plants landscaping.
- .2            BNQ 0419-070 – Stone with agricultural lime.
- .3            Ministry of Transport of Quebec, Standard 13101 - Geotextiles

**1.3                ANALYSIS AND TRIES**

- .1            At least 2 days before the beginning of the works, indicate to the consultant the source of supply proposed for the topsoil. The contractor has to proceed afterward to the analysis of materials.
- .2            Analyze the topsoil to establish the content in nitrogen, phosphor, potassium ( NPK), magnesium ( Mg), soluble salts, organic matters as well as to determine the pH:
  - .1            By means of a tube or a sampling spade of 25 mm in diameter, extract 25 carrots by hectare, and that on all the topsoil's depth and at random on the entire surface to be worked or to be cleaned. Well mix samples before submitting them to the test laboratory.
  - .2            Submit to the test laboratory a sample of 0,5 kg of topsoil and indicate clearly the use for which we intend it, the type of mulch which will be used, the nature of the subgrade and the efficiency of the system of drainage. Pack the sample and send it according to the current provincial regulations.
  - .3            Establish the quantity of lime or sulfur to be added so that the pH is situated between 5,5 and 7,5

**1.4                WORK SCHEDULING**

- .1            The manuring of the topsoil and the finishing grading must be made at the appropriate time to allow undertaking the sodding and seeding works in the best possible conditions. Submit the works calendar to the consultant.

**1.5                TRANSPORT AND STORING**

- .1            Transport and store the fertilizer, the lime and the sulfur in a tight bags carrying a label with a slip which must indicate the weight, the composition as well as the name of the manufacturer.

## **Part 2            Products**

### **2.1            TOPSOIL**

- .1    Origin of the topsoil
  - .1    Soil in place for repaired areas
- .2    Topsoil
  - .1    Soil in place: containing less than 5 % of alive vegetation, loosened and harrowed. it must be amended according to the particular requirements of the plantation and the results of the analysis;
  - .2    Topsoil: top layer of the natural ground, consisting in dirt, loose, sowing, clayey sowing or sandy sowing the content of which in humus is 3 % at least and 20 % at the most. The pH has to be situated between 6,0 and 7,0. She has to contain no more than 5 % of live vegetation or roots, less than 10 % of stones and no other foreign debris exceeding 25 mm in diameter fragment;
- .3    Texture based on the Canadian System of classification of grounds, constituted from 20 to 70 % of sand and from 2 to 10 % of organic matters in weight.
- .4    Fertility: major soil nutrients present in following amounts:
  - .1    Nitrogen ( N ) 20 in 40 micrograms of nitrogen by gram of topsoil;
  - .2    Phosphor ( P ): 10 in 20 micrograms of phosphate by gram of topsoil;
  - .3    Potassium ( K ): 80 in 120 micrograms of potassium by gram of topsoil;
  - .4    Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
- .5    The pH rating: 6.5.
- .6    Contain no toxic elements or growth inhibiting materials.
- .7    Free of debris and stones over 50 mm diameter and also of course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .8    Consistence: friable when moist.

### **2.2            HERBICIDE**

- .1    Consistence: friable when moist.

### **2.3            SOIL AMENDMENTS AND FERTILIZATION**

- .1    Peatmoss: constituted with a minimum of 75 % of plant residues coming from plants developed and decomposed into environment almost constantly saturated by water, enough flexible and homogeneous, 60 % of organic matters free from colloidal residues, from wood, from sulfur and from iron, containing a maximum of 4 % of ash compared with the dry weight, and containing a moisture content of

15 % , with a pH between 4,5 and 6,0. The thickness of the shredded particles must be equal or lower in 6 mm.

.2 Fertilizing agents:

- .1 Commercial Fertilizer containing at least 50 % of elements, derived of inorganic source, in slow action, containing in most 35 % of soluble nitrogen in the water.
- .2 Manure composed of a straw mixture or fodder and with liquid or solid animal excrement having stayed 2 years in heap until decomposition by fermentation.
- .3 Limestone:
- .4 Agricultural ground meeting Lime the requirements of the standard BNQ 0419-070.
- .5 Bone powder: stewed, bone powder, fine grounded, containing at least 3 % of nitrogen and 20 % of phosphoric acid.
- .6 Sulphurate: elementary sulfur, fine grounded, free from any impurity.

**Part 3 Execution**

**3.1 PREPARATION OF EXISTING GRADE**

- .1 Weed the ground in place by means of a systematic weed-killer by respecting the rates and the delays of application prescribed by the supplier.
- .2 Loosen the ground until a 250 mm depth and harrow on a 100 mm depth.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

**3.2 PREPARATION OF THE INFRASTRUCTURE**

- .1 Level the foundation by breaking clods and by eliminating depression and harshness and by giving it a slope which favors a good drainage. Remove fragments, roots, branches, weed, pebbles of more than 25 mm in diameter as well as all other harmful materials. Remove the ground contaminated with toxic materials, the petroleum products and the chloride of calcium.
- .2 Loosen parallel passes in the direction of the slope on a 100 mm depth all the surface of the layer of foundation which has to receive the topsoil. Repeat the operation perpendicularly to the first passes in the places where the material used for the landscaping and the manuring has compacted the foundation layer.

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

- .1 Have inspected and approve the foundation layer by the consultant before beginning the spreading of the topsoil.

- .2 Spread the topsoil, with sufficient humidity content, in uniform layers not exceeding 150 mm. in thickness. Do the manuring on a day with dry weather, on a dry and non-frozen foundation layer, in the indicated places, at most one week before the seeding or sowing work.
- .3 Adjust the level, by leaving a 15 mm thickness for the surface layer, to the areas where we have to put lawn borders. Everywhere else, the thickness of the topsoil layer has to fit the finished surface level.
- .4 Spread topsoil to following minimum depths after settlement.
  - .1 150 mm for seeded areas.
  - .2 135 mm for sodded areas.
- .5 Before spreading the topsoil, clear it from pebbles, roots, weed, turfs clods, building materials, fragment, and other.
- .6 Manually spread topsoil/planting soil around trees, shrubs and obstacles.
- .7 Take into account a 25 % settlement in volume during the implementation of the dirt to respect the planned levels.

### **3.4 AMENDMENTS**

- .1 Incorporate the lime, the sulfur or another material of amendment in quantities determined from the results of the analysis of the ground samples and according to the requirements linked to the diverse horticultural applications.
- .2 Penetrate the material under all the depth of the layer of soil, either by ploughing it, or by working it with a motorized cultivator, before incorporating it the fertilizer.

### **3.5 APPLICATION OF THE FERTILIZER**

- .1 Unless contraindication resulting from analyses of the ground, to incorporate an organic fertilizer: compost or fertilizer at the rate recommended by the manufacturer.
- .2 Spread the fertilizer at least one week after the application of the lime and at least 6 days before proceeding to the sowing or to the sodding.
- .3 Spread the fertilizer on all the surface of the topsoil by respecting the quantities recommended by the manufacturer. Use only mechanical spreaders.
- .4 Penetrate the fertilizer into all the layer of topsoil.

### **3.6 FINISH GRADING**

- .1 Execute the finishing landscaping of the area covered with topsoil according to the profiles and the levels indicated; remove the disparities and insure an effective evacuation of the surface waters.

.2 Before proceeding to the sowing or to the sodding, levelling and moving the topsoil so as to eliminate the harshness and the low points. Prepare a layer of loosened topsoil by removing the mud clods at first and by raking it after., if the topsoil is to loose, compact it slightly with a roller, then rake it.

.3 To compact and firm up the surface, use a roller measuring at least 900 mm in width and weighting approximately 50kg. Avoid rolling in a repeated way at the same place.

.1 Leave surfaces smooth, uniform and firm against deep footprinting.

### **3.7 RESTORATION OF THE DUMPING AREA**

.1 Recondition the dumping areas situated on the location or adjacent to the location being the object of the present contract.

### **3.8 SURPLUS MATERIAL**

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

**END OF SECTION**



## **1 GENERAL**

### **1.01 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Samples.
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit:
  - .1 Sod for each type specified.
    - .1 Install approved samples in one square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
- .3 Obtain approval of samples by Departmental Representative.

### **1.02 QUALITY ASSURANCE**

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements. Comply with Section 01 31 19.

### **1.03 SCHEDULING**

- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation when frost is not present in ground.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

## **2 PRODUCTS**

### **2.01 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: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
- .2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
- .3 Number One Named Cultivars: Nursery Sod grown from certified seed.
- .2 Turf Grass Nursery Sod quality:
  - .1 Not more than 2 broadleaf weeds or 10 other weeds per 40 square metres.
  - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
  - .3 Mowing height limit: 35 to 65 mm.
  - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Sod establishment support:
  - .1 Wooden pegs: 17 x 8 x 200 mm.
- .3 Water:
  - .1 Supplied by Departmental Representative at designated source.
- .4 Fertilizer:
  - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
  - .2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

## **2.02 SOURCE QUALITY CONTROL**

- .1 Obtain 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**

### **3.01 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 do not commence work until 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, to contours and elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod, 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 .



### 3.02 SOD PLACEMENT

- .1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .2 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.
- .3 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.

### 3.03 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 3horizontal 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.

### 3.04 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
- .3 Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which will smother grassed areas as directed by Departmental Representative.
- .4 Maintain sodded areas weed free 95%.
- .5 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

### 3.05 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.

### **3.06 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 as directed by Departmental Representative to height as follows:
  - .1 Turf Grass Nursery Sod:
    - .1 50 mm during normal growing conditions.
  - .2 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.
  - .3 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.
  - .4 Eliminate weeds by mechanical means to extent acceptable to Departmental Representative.

### **3.07 CLEANING**

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

**END OF SECTION**

## **1 GENERAL**

### **1.01 MEASUREMENT PROCEDURES**

- .1 Measure tree pruning for payment per tree.

### **1.02 REFERENCES**

- .1 American National Standard Institute (ANSI)
  - .1 ANSI A300 (Part 1)-2001, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (revision and re-designation of ANSI A300-1995) (includes supplements).
  - .2 ANSI A300 (Part 2)-1998, Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization.
  - .3 ANSI A300 (Part 3)-2000, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - Tree Support Systems (a. Cabling, Bracing, and Guying) (supplement to ANSI A300-1995).
- .2 Canadian Nursery Landscape Association (CNLA)
- .3 International Society of Arboriculture (ISA)
- .4 Ontario Ministry of Agriculture, Food and Rural Affairs
  - .1 Publication 483-2004, Pruning Ornamentals.

### **1.03 DEFINITIONS**

- .1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.
- .2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.
- .3 Crown Raising: consists of removal of lower tree branches to provide clearance.
- .4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.
- .5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.
- .6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

### **1.04 QUALITY ASSURANCE**

- .1 Certification: provide Canadian Nursery Landscape Association certification.
- .2 Regulatory requirements: provide safety certificate as approved by local hydro utility.
- .3 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:
  - .1 Knowledge of target areas including branch bark ridge and branch collars.

- .2 Technique for selection process and pruning used to establish desired form and shape for each species.
- .4 Acceptance of Work will be determined by Departmental Representative from field sample.
- .5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.05 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Divert wood materials from landfill to composting as directed by Departmental Representative.

#### **1.06 TOOL MAINTENANCE**

- .1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.
- .2 Disinfect tools before each tree is pruned.
- .3 On diseased plant material disinfect tools before each cut.

### **2 PRODUCTS**

#### **2.01 DISINFECTANT**

- .1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

### **3 EXECUTION**

#### **3.01 APPLICATION**

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

#### **3.02 GENERAL**

- .1 Prune in accordance with Pruning Ornamentals ANSI A300, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.

- .2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.
- .3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.
- .4 Prune each species when in full leaf.
- .5 Retain natural form and shape of plant species.
- .6 Do not:
  - .1 Flush cut branches.
  - .2 Crush or tear bark.
  - .3 Cut behind branch bark ridge.
  - .4 Damage branch collars.
  - .5 Damage branches to remain.

### 3.03 PRUNING

- .1 Remove dead, dying, diseased and weak growth from plant material to provide crown cleaning and crown restoration as designated by Departmental Representative in order to promote healthy growth.
- .2 Remove live branches that:
  - .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
  - .2 Are of weak structure including narrow crotches.
  - .3 Obstruct development of more important branches.
  - .4 Are broken.
- .3 Remove live branches to re-establish natural species form including:
  - .1 One or more developing leaders.
  - .2 Multiple growth due to previous topping.
  - .3 Branches extending outward from natural form.
  - .4 Undesirable sucker growth.
- .4 Remove loose branches, twigs and other debris lodged in tree.
- .5 Remove vines.
- .6 For branches under 50 mm in diameter:
  - .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
  - .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
  - .3 Do not cut lead branches unless directed by Departmental Representative.
- .7 For branches greater than 50 mm in diameter:
  - .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.

- .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
- .3 Make final cut adjacent to and outside branch collar.
- .8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.
  - .1 Repair areas which are damaged, or remove damaged area back to next branch collar.
- .9 Remove additional growth designated by Departmental Representative.

#### **3.04 ROOT GIRDLING**

- .1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.
- .2 Remove exposed portion of girdling root as directed by Departmental Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

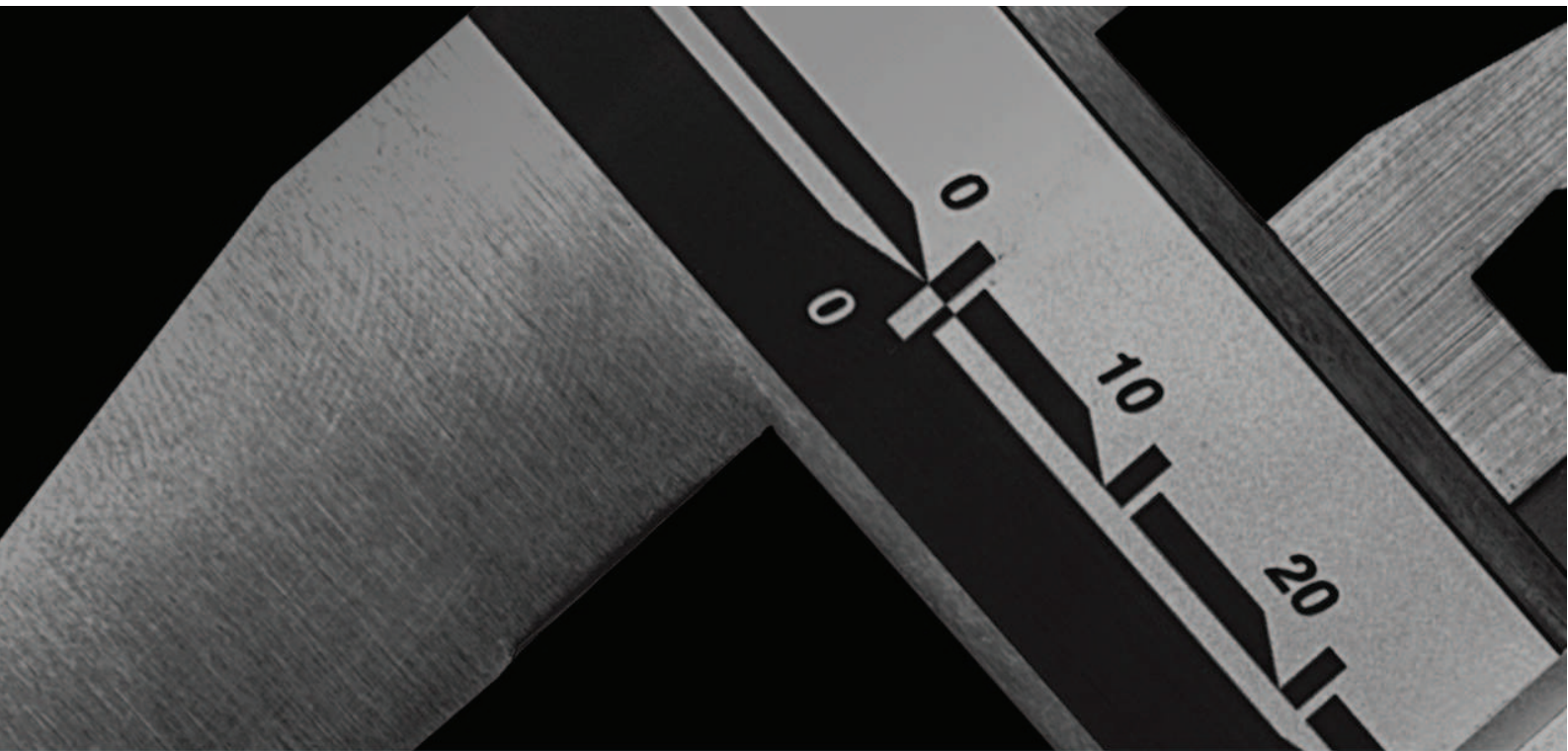
#### **3.05 CARE OF WOUNDS**

- .1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

#### **3.06 CLEAN-UP**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Collect and dispose of pruned material daily and remove from site.
- .3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

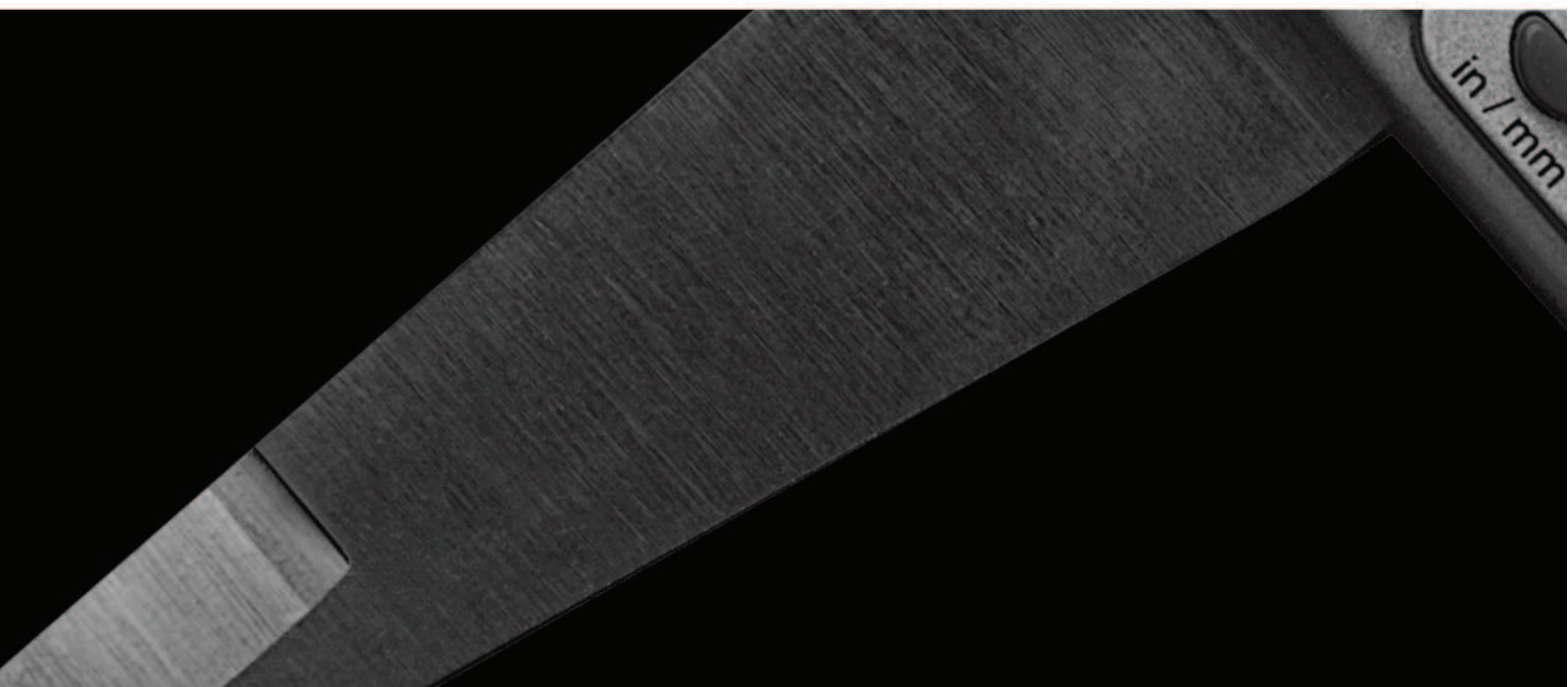
**END OF SECTION**



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16 avril 2014







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H7T 2P6

Objet : Étude géotechnique  
Référence no M032069-A2  
Nouvelles infrastructures  
6099, boulevard Lévesque Est  
Laval, Québec

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Monsieur,

C'est avec plaisir que nous vous transmettons notre rapport d'étude géotechnique no M032069-A2, concernant le projet de nouvelles infrastructures au Centre Fédéral de Formation du Service correctionnel du Canada, situé au 6099, boulevard Lévesque Est à Laval, Québec.

Nous vous remercions d'avoir retenu les services techniques et professionnels d'Inspec-Sol et nous espérons avoir le privilège de vous servir à nouveau dans le futur.

Notre objectif sera toujours de vous offrir un service à la mesure de vos attentes!

N'hésitez pas à communiquer avec nous pour tout renseignement complémentaire en composant le (514) 333-5151.

Veuillez croire, Monsieur, à l'expression de nos sentiments les meilleurs.

INSPEC-SOL INC.



Éric Boulanger, ing., M.Sc.

EB/sf

**BPR INC.**

**Étude géotechnique  
Nouvelles infrastructures  
6099, boulevard Lévesque Est  
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**BPR INC.**  
2500, boul. Daniel-Johnson  
Laval, Québec (H7T 2P6)

**Étude géotechnique  
Nouvelles infrastructures  
6099, boulevard Lévesque Est  
Laval, Québec**

**N/Réf.: M032069-A2  
Le 16 avril 2014**

**Préparé par :**



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Le respect de l'environnement et la préservation de nos ressources naturelles sont des priorités pour Inspec-Sol inc. Dans cette perspective, nous imprimons nos documents recto-verso sur un papier 50 % recyclé.

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## 1.0 Introduction

---

Les services professionnels d'Inspec-Sol inc. (**Inspec-Sol**) ont été retenus par la firme BPR inc., représentée par Monsieur Jean-Claude Provost, ing., afin d'effectuer une étude géotechnique dans le cadre d'un projet de construction de nouvelles infrastructures au Centre Fédéral de Formation (CFF) du Service Correctionnel du Canada, situé au numéro civique 6099, boulevard Lévesque Est à Laval, Québec.

L'envergure de l'étude réalisée est décrite dans notre offre de services professionnels portant le numéro PA-35377, datée du 26 février 2014 et adressée à Monsieur Jean-Claude Provost, ing.

Les travaux de sondage effectués dans le cadre de l'étude géotechnique avaient pour but de déterminer la nature ainsi que les caractéristiques géotechniques des sols au site retenu pour le projet, afin d'émettre des recommandations concernant les capacités portantes aux états limites des matériaux présents, le type de fondations à envisager, la catégorie d'emplacement du site, la préparation des assises granulaires pour les dalles sur sol, les tranchées de services souterrains ainsi que le contrôle de l'eau souterraine.

Ce rapport rend compte des travaux effectués sur le site, présente les résultats obtenus et contient des recommandations et des commentaires relativement à la conception et à la construction du projet précité.

Dans le cadre de l'étude géotechnique, des échantillons de sol ont par ailleurs été sélectionnés et soumis à des analyses chimiques de façon à évaluer sommairement la qualité environnementale des matériaux présents sur le site, dans l'optique de la gestion de déblais d'excavation lors de travaux d'aménagement du site. Il est à noter que ces analyses environnementales ne correspondent pas à une caractérisation environnementale-phase II du terrain.

Le texte du rapport est accompagné d'une série de quatre (4) annexes où l'on retrouve successivement un dessin de localisation illustrant l'implantation des forages sur le terrain (annexe 1), les rapports de forage (annexe 2), les résultats des essais géotechniques de laboratoire (annexe 3) et les résultats des analyses chimiques (annexe 4).

Ce rapport est assujéti à un certain nombre de conditions limitatives découlant de la nature inhérente aux profils géologiques, géotechniques et hydrogéologiques de tout site faisant l'objet d'investigations par sondages. La portée de l'étude réalisée et les limitations qui s'y appliquent sont énoncées à la fin du texte technique. Ces conditions limitatives font partie intégrante de ce rapport et le lecteur est prié d'en prendre connaissance afin de faciliter sa compréhension, son interprétation et son utilisation du présent document.

## **2.0 Localisation et description du site**

---

Le site correspond au Centre Fédéral de Formation du Service Correctionnel du Canada situé au numéro civique 6099, boulevard Levesque Est à Laval, Québec.

Plus spécifiquement, cinq forages ont été réalisés dans l'enceinte du CFF délimité par une muraille et un forage a été réalisé entre le bâtiment C-15 et la muraille sud du CFF. Le site est relativement plat à l'intérieur de l'enceinte et couvre une superficie d'environ 95 000 m<sup>2</sup>. Le forage no F-101, à l'extérieur de l'enceinte, est surélevé d'environ 2 m par rapport aux autres forages.

Les principales caractéristiques du site sont illustrées sur le dessin de localisation des forages no M032069-A2-1, joint à l'annexe 1 du présent document.

## **3.0 Méthode de reconnaissance**

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### **3.1 Travaux d'arpentage**

Un plan du site avec la localisation des forages demandés nous a d'abord été transmis par le client avant le début des travaux de terrain. Ce plan a servi de document de base à notre personnel technique pour procéder à l'implantation des forages sur le site à investiguer.

Les élévations de la surface du sol à l'emplacement des forages et aux autres points indiqués ont été mesurées par le technicien de chantier, le 14 mars 2014, avec un appareil de positionnement satellitaire (GPS) de précision centimétrique de marque *Leica* (système d'exploitation *Viva*). Le repère géodésique porte le no RTCM-REF 3144, correspondant à une antenne de téléphonie cellulaire de la compagnie *Bell Mobilité*, ayant une élévation géodésique connue de 28,74 m.



### 3.2 Travaux de sondage

Les travaux de sondage ont consisté en l'exécution de six (6) forages stratigraphiques (identifiés nos F-101 à F-106) réalisés les 12 et 14 mars 2014, sous la surveillance d'un membre du personnel technique d'**Inspec-Sol**.

Les forages ont été effectués au moyen d'une foreuse à tarières évidées de marque *CME-55* montée sur un chenillard. Le forage no F-101 a atteint une profondeur de 6,10 m et les forages nos F-102 à F-105 ont atteint des profondeurs variant de 4,27 m à 4,88 m (élevations comprises entre 16,58 m et 16,74 m).

Lors de l'exécution des forages, des échantillons de sol ont été récupérés à intervalle régulier, en utilisant une cuillère fendue standard de calibre « B » (51 mm de diamètre extérieur). La cuillère fendue permet aussi d'obtenir des informations sur la compacité des couches de sol traversées, en obtenant des valeurs de pénétration appelées indices «N», correspondant à l'essai de pénétration standard («SPT»).

Des échantillons intacts (TM) ont aussi été prélevés au sein du dépôt d'argile dans les forages nos F-101 et F-104, à des profondeurs jugées pertinentes à l'aide de tubes à paroi mince de type Shelby (75 mm de diamètre) montés sur un échantillonneur.

Des essais de résistance au cisaillement des sols argileux ont été effectués à l'aide de la foreuse en place une fois l'échantillonnage des sols terminé dans le forage no F-101. Les essais ont été réalisés au moyen d'un scissomètre de chantier de marque *Nilcon*, en conformité avec les exigences de la norme BNQ NQ 2501-200.

Un essai de pénétration dynamique a été effectué dans le forage no F-101. Pour ce sondage, un train de tiges (48 mm de diamètre) muni d'une pointe conique (10 cm<sup>2</sup>) est battu à l'aide du même équipement servant à réaliser l'essai de pénétration standard. Le nombre de coups requis pour chaque course de 300 mm de pénétration correspond à l'indice de pénétration dynamique  $N_d$ . Le battage du train de tiges a été interrompu à une profondeur de 18,44 m suite à un refus technique de la pénétration, soit plus de 100 coups par 300 mm d'enfoncement (voir la section sur la description des sols).

### 3.3 Travaux de laboratoire

Tous les échantillons de sol recueillis lors des travaux de forage ont été acheminés à notre laboratoire, afin d'être soumis à un examen visuel plus approfondi et à différents essais et analyses.

Des échantillons représentatifs des sols en place ont été sélectionnés afin de procéder aux analyses en laboratoire suivantes :

- ♦ trois (3) déterminations des limites d'Atterberg (norme NQ 2501-092);
- ♦ trois (3) déterminations de la teneur en eau naturelle (norme NQ 2501-170).

Ces essais ont été réalisés afin de compléter les informations recueillies au chantier. Les résultats de ces essais sont présentés à la section 4.0, de même qu'à l'annexe 3.

Les échantillons prélevés dans les forages seront conservés pour une période de six mois à partir de la date d'émission de ce rapport, après quoi nous en disposerons à moins d'avis contraire de la part du client.

## 4.0 Description sommaire des sols

---

La description détaillée des sols observés au droit des forages est indiquée sur les rapports de forage individuel joint à l'annexe 2. Une description sommaire de la stratigraphie rencontrée dans les forages est présentée dans les paragraphes suivants.

### 4.1 Enrobé bitumineux, fondation granulaire et matériaux de remblai

Dans le forage no F-102, un enrobé bitumineux a été rencontré en surface sur une épaisseur de 130 mm, suivi d'une fondation granulaire composée de pierre concassée grise de calibre apparent 20-0 mm, jusqu'à une profondeur de 1,11 m (élévation de 19,74 m).

Des matériaux de remblai ont été rencontrés jusqu'à des profondeurs variant de 0,50 m à 2,99 m (élevations comprises entre 17,82 m et 20,51 m). Dans le forage no F-101, ces matériaux consistent en une couche de terre végétale de surface de 100 mm d'épaisseur, composée de silt brun, suivie d'une couche de brique broyée d'une épaisseur de 300 mm puis d'une couche composée de scories jusqu'à 0,86 m de profondeur. Dans le forage no F-103, le remblai est constitué de silt sableux brun jusqu'à 0,50 m de profondeur.

Dans les forages nos F-104 à F-106, on retrouve des matériaux de remblai composés d'argile remaniée avec diverses proportions de silt, avec la présence de débris tels que de la brique, du bois et des scories. L'épaisseur de remblai est importante dans les forages nos F-104 et F-105 (respectivement 2,99 m et 2,21 m).

Les matériaux de remblai rencontrés sont dans un état qualifié de lâche à compact, avec des indices « N » variant de 3 à 18.

## 4.2 Dépôt d'argile

Sous les matériaux superficiels mentionnés précédemment, un dépôt naturel d'argile silteuse a été rencontré dans tous les forages. Une croûte argileuse est rencontrée en surface du dépôt dans les forages nos F-101, F-102, F-103 et F-106, jusqu'à des profondeurs variant de 1,83 m à 3,05 m (élevations de 17,73 m à 20,85 m). Cette croûte est de couleur brune et possède une consistance très raide à raide.

Le dépôt d'argile sous la croûte est gris, très humide à saturé. La consistance de l'argile s'avère ferme à raide en profondeur. Selon les essais au scissomètre de chantier réalisé à proximité du forage no F-101, le dépôt d'argile possède des résistances au cisaillement non drainé ( $c_u$ ) variant entre 32 kPa et 48 kPa jusqu'à environ 6 m de profondeur, et des résistances au cisaillement non drainé ( $c_u$ ) généralement supérieures à 50 kPa par la suite.

Trois (3) échantillons ont été soumis à la détermination des limites de consistance (limites d'Atterberg). Les résultats sont présentés dans le tableau ci-dessous :

**Tableau no 1**  
**Résultats des limites d'Atterberg sur le dépôt d'argile**

| Forage no | Échantillon no | Profondeur (m) | Limite de plasticité | Limite de liquidité | Indice de plasticité | Teneur en eau (%) | Classification USCS |
|-----------|----------------|----------------|----------------------|---------------------|----------------------|-------------------|---------------------|
| F-101     | CF-3           | 1,22 - 1,83    | 26                   | 75                  | 49                   | 46                | CH                  |
| F-101     | TM-4           | 1,83 - 2,44    | 25                   | 76                  | 51                   | 60                | CH                  |
| F-101     | TM-7           | 3,66 - 4,27    | 24                   | 69                  | 45                   | 59                | CH                  |

La classification unifiée des sols indique que l'argile est classifiée « CH », correspondant à une argile silteuse inorganique de grande plasticité.

Les forages nos F-02 à F-06 ont été terminés dans le dépôt d'argile à des profondeurs variant de 4,27 m à 4,88 m (élevations comprises entre 15,93 m et 16,74 m).

L'échantillonnage dans le forage no F-01 a été terminé au sein du dépôt d'argile à une profondeur de 6,10 m (élévation de 16,58 m). Il a été poursuivi par un essai de pénétration dynamique jusqu'à un refus sur le roc ou un sol très dense, à la profondeur de 18,44 m (élévation de 4,24 m).

## 5.0 Eau souterraine

---

Basé sur le degré d'humidité des échantillons récupérés, le niveau de l'eau souterraine au moment des travaux a été estimé entre 2 m et 3 m de profondeur par rapport à la surface actuelle du terrain.

Il est à noter cependant que le niveau de l'eau souterraine est susceptible de fluctuer selon les conditions climatiques ou les variations saisonnières et pourra donc être rencontré à des élévations différentes lors des travaux de construction.

De plus, considérant la nature peu perméable du dépôt naturel d'argile, il sera possible de rencontrer localement des nappes perchées dans les matériaux de remblai présents au-dessus de ce dépôt.

## 6.0 Analyses chimiques des sols pour fins de disposition

---

Dans le cadre de la présente étude, des échantillons de sols ont été prélevés pour fins d'analyses chimiques. L'inspecteur de chantier **d'Inspec-Sol** était responsable de la manipulation des divers échantillons. Une procédure rigoureuse de gestion conforme au *Guide d'échantillonnage à des fins d'analyses environnementales du ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP)*, a été suivie lors du prélèvement, de l'identification, de l'entreposage temporaire et du transport des échantillons, de façon à assurer leur conservation et leur intégrité jusqu'à leur acheminement au laboratoire analytique.

Cinq (5) échantillons de sol a été soumis à des analyses chimiques pour le dépistage des hydrocarbures pétroliers ( $C_{10}$  à  $C_{50}$ ), des hydrocarbures aromatiques polycycliques (HAP) et de treize (13) métaux (argent, arsenic, baryum, cadmium, cobalt, chrome, cuivre, étain, nickel, plomb, manganèse, molybdène et zinc).

Un échantillon de matière résiduelle (constitué de scories) a été analysé pour le dépistage des paramètres (matière lixiviable) listés à l'article 3 du *Règlement sur les matières résiduelles dangereuses* (RMD). Les paramètres analysés ont été choisis afin de pouvoir déterminer le lieu de disposition des sols excavés.

Les analyses chimiques ont été réalisées par le laboratoire *Maxxam Analytique inc. (Maxxam)* qui est reconnu et accrédité par le *MDDEFP*. Elles ont été effectuées selon les directives du *Guide des méthodes de conservation et d'analyses des échantillons d'eau et de sol* du *MDDEFP*. Les certificats des analyses chimiques préparées par *Maxxam* sont regroupés à l'annexe 4.

À des fins de gestion des sols excavés, les résultats des analyses chimiques ont été interprétés selon la Grille des critères génériques pour les sols de la Politique de protection des sols et de réhabilitation des terrains contaminés du *MDDEFP* et selon les valeurs limites du *Règlement sur l'enfouissement des sols contaminés (RESC)* du *MDDEFP*.

Le tableau suivant présente la classification environnementale des échantillons de sol en fonction des résultats des analyses chimiques réalisées et des critères génériques ou des valeurs limites :

**Tableau no 2**  
**Classification environnementale des sols**  
**Rapport de *Maxxam* du 20 mars 2014**

| Échantillon no | Profondeur (m) | Paramètres analysés               |     |        |
|----------------|----------------|-----------------------------------|-----|--------|
|                |                | C <sub>10</sub> à C <sub>50</sub> | HAP | Métaux |
| F-02 CFE-3     | 1,22 - 1,83    | <A                                | <A  | A-B    |
| F-03 VRE-2     | 0,00 - 0,50    | <A                                | <A  | <A     |
| F-04 CFE-3     | 1,22 - 1,83    | <A                                | <A  | A-B    |
| F-05 VRE-2     | 0,00 - 0,61    | <A                                | <A  | <A     |
| F-06 CFE-2     | 0,61 - 1,22    | <A                                | <A  | A-B    |

Le critère générique « A » est le seuil à partir duquel des restrictions peuvent être imposées lorsque des sols sont excavés. Les sols classés « A-B » qui seront excavés devront être gérés selon la grille du *MDDEFP*.

Les résultats de l'analyse chimique de l'échantillon de matières résiduelles (réalisé pour l'échantillon du forage no F-01 constitué de scories) ont été comparés aux normes (matière lixiviable) de l'article 3 du *Règlement sur les matières dangereuses* (RMD). Le tableau suivant présente les valeurs (matière lixiviable) du RMD du *MDDEFP* et les concentrations des paramètres analysés dans les échantillons de matières résiduelles :

**Tableau no 3**  
**Concentrations (en mg/L) des paramètres analysés – matières résiduelles**  
**Rapport de Maxxam du 20 mars 2014**

| Paramètre  | Normes - RMD | Échantillon no F-01 CFE-2A |
|--|--------------|----------------------------|
| Fluorures (F)  | 150          | <1                         |
| Mercure (Hg)   | 0,1          | <0.01                      |
| Nitrates et Nitrites (NO <sub>3</sub> et NO <sub>2</sub> ) | 1000         | <0.2                       |
| Nitrites (NO <sub>2</sub> )                                | 100          | <0.2                       |
| Baryum (Ba)  | 100          | 0.18                       |
| Bore (B)   | 500          | <0.1                       |
| Cadmium (Cd)   | 0,5          | <0.002                     |
| Chrome (Cr)  | 5,0          | <0.007                     |
| Plomb (Pb)   | 5,0          | <0.01                      |
| Sélénium (Se)  | 1,0          | <0.005                     |
| Arsenic (As)   | 5,0          | <0.004                     |
| Uranium (U)  | 2,0          | <0.02                      |

--- : aucun critère applicable ; n.a. : non analysée

Tous les résultats d'analyses chimiques des matières résiduelles ont montré des concentrations inférieures aux valeurs de l'article 3 du RMD.

Les analyses chimiques des échantillons ont été réalisées uniquement afin de pouvoir déterminer le lieu de disposition des sols qui seront excavés et, par conséquent, la présente section ne peut pas être considérée comme étant une étude de caractérisation environnementale du site.

La classification environnementale des sols a été déterminée à partir des résultats d'analyses chimiques effectuées sur un nombre limité d'échantillons. Lors de la réalisation du projet, il est donc possible qu'un site récepteur exige des analyses supplémentaires (échantillons ou paramètres) avant d'accepter des sols excavés pour disposition.

La nature et le degré de contamination des sols entre les points d'échantillonnage peuvent varier par rapport aux conditions rencontrées à l'endroit où ont été prélevés les échantillons analysés. Compte tenu de la nature souvent très ponctuelle et hétérogène des phénomènes de contamination environnementale, les conclusions de l'échantillonnage s'appliquent uniquement aux endroits sondés. Les conclusions générales portant sur l'ensemble du site sont fournies à titre indicatif et sur une base probabiliste.

L'interprétation environnementale des résultats d'analyses présentés dans ce rapport réfère aux critères environnementaux en vigueur au moment de l'étude et applicables au site étudié. Les niveaux de contamination présentés dans ce rapport doivent être considérés valides uniquement à la période où les échantillonnages ont été réalisés puisque ces niveaux peuvent varier suite à des activités humaines subséquentement entreprises sur le site investigué ou sur des sites adjacents.

## **7.0 Recommandations et commentaires**

---

### **7.1 Généralités**

Selon les informations transmises par le client, le projet prévoit l'installation de nouvelles infrastructures, notamment un cabanon électrique dans la zone du forage no F-101 ainsi que l'installation souterraine de câbles électriques, à l'intérieur de l'enceinte du CFF.

Pour cette étude, le dessous de la dalle sur sol du cabanon électrique sera au niveau actuel du terrain, soit à l'élévation géodésique approximative de 22,7 m et que les fondations du cabanon sont prévues à environ 2,8 m de profondeur par rapport au niveau actuel du terrain (soit à l'élévation géodésique approximative de 19,9 m). De plus, les tranchées pour les câbles électriques souterrains seront excavées jusqu'à une profondeur maximale de 2 m.

Basé sur notre connaissance actuelle du projet et sur les conditions de sols observées à l'emplacement des forages, les recommandations et commentaires suivants sont présentés.

### **7.2 Cabanon électrique**

#### **7.2.1 Excavation**

Basé sur la stratigraphie du terrain, les excavations pour les nouvelles fondations seront réalisées à travers des matériaux de remblai et le dépôt naturel d'argile.

À titre indicatif, des pentes de talus non supportées de l'ordre de 1,0 H : 1,0 V peuvent être considérées dans le mort-terrain, pour des excavations temporaires n'excédant pas 3,0 m de profondeur.

Il est recommandé d'utiliser un godet lisse lors de la réalisation des excavations.

Les parois devront être recouvertes de membranes imperméables afin de prévenir l'érosion et le développement d'instabilités locales dans le sol.

Les déblais d'excavation devront aussi être déposés à une distance minimale équivalente à la profondeur des tranchées.

Toute pente d'excavation non supportée devra être ajustée en fonction des conditions réelles du terrain (densité des sols, présence d'eau, de débris, évidence d'instabilités locales, etc.) rencontrées lors de l'excavation.

La réalisation de pentes d'excavation non supportées stables et sécuritaires durant les travaux demeure en tout temps la responsabilité de l'entrepreneur.

### **7.2.2 Fondations**

Le terrain étudié se prête à l'utilisation de fondations conventionnelles, de type semelles filantes et/ou isolées, pour reprendre les charges qui seront transmises au sol par la structure projetée. Les semelles devront reposer au sein du dépôt naturel d'argile.

#### **7.2.2.1 Capacité portante aux états limites**

Une capacité portante aux états limites de service (ELS) de 75 kPa pourra être utilisée pour la conception des fondations du cabanon.

L'utilisation d'une semelle d'une largeur inférieure à 0,76 m n'est pas recommandée. Sous la contrainte présentée ci-dessus, les tassements totaux et différentiels des semelles ne devraient pas excéder 25 mm et 19 mm, respectivement.

Ces valeurs de tassement supposent toutefois que la surface d'assise au niveau des semelles sera libre de toute boue et de tout sol remanié avant de procéder au bétonnage de la fondation.



Une capacité portante aux états limites ultimes (ELU) de 200 kPa pourra être utilisée pour le dimensionnement des fondations.

Un coefficient de pondération de la résistance de 0,5 devra être appliqué à la capacité portante aux ELU pour la conception.

#### **7.2.2.2 Catégorie d'emplacement**

Pour les futures fondations prenant appui au niveau prévu, une catégorie d'emplacement du site « D » pourra être utilisée pour la conception parasismique du cabanon. Cette catégorie se rapporte à un « sol consistant » selon le *Code national de bâtiment du Canada (CNB)* 2005 (Réf.: Tableau 4.1.8.4.A.).

#### **7.2.2.3 Protection contre le gel**

Toutes les fondations extérieures de structure chauffée et non chauffée devraient être placées à des profondeurs minimales respectives de 1,4 m et 1,8 m par rapport au niveau final du terrain extérieur de façon à obtenir une protection adéquate contre les effets de la pénétration du gel dans le sol. Alternativement, la pose d'isolant pourrait être retenue pour palier au manque de couverture des sols.

#### **7.2.3 Dalle sur sol**

Une dalle sur sol conventionnelle, c'est-à-dire structuralement séparée des murs de fondation et des colonnes, peut être utilisée pour la construction du cabanon électrique.

La dalle ne pourra toutefois pas être appuyée directement sur les matériaux de remblai présents sur le site. Tous ces matériaux devront donc être excavés et remplacés par un remblai contrôlé. Le remblai contrôlé devrait être constitué de matériaux granulaires bien étalés, tels qu'un sable bien gradué ou de la pierre concassée bien calibrée, répondant à la classe MG-112 de la norme NQ 2560-114. Il devra être mis en place en couches minces ( $\pm 300$  mm) et compacté à 95 % de la densité maximale sèche obtenue en laboratoire à l'essai Proctor modifié sur le matériau utilisé lors du remblayage.

Immédiatement sous la dalle, il est recommandé de prévoir la mise en place d'une couche de pierre concassée de calibre 20-0 mm, à titre de fondation pour cette dernière. L'épaisseur minimale de pierre concassée recommandée est de 300 mm. Cette couche devra être densifiée à 95 % de la densité maximale sèche du matériau obtenu à l'essai Proctor modifié.

Il est important de prévoir la mise en place d'une membrane imperméable (polyéthylène, etc.) entre le remblai granulaire en place et la dalle de béton, ceci afin de diminuer les risques de sulfatation du béton dans le futur.

Tous les nouveaux matériaux granulaires qui seront utilisés sous les dalles de plancher ne devront pas contenir de matériaux argileux potentiellement gonflants, tels que du shale ou du calcaire argileux. Pour ce faire, lesdits matériaux devront être certifiés « matériaux DB » selon la norme BNQ 2560-510 qui caractérise le potentiel de gonflement des matériaux granulaires.

#### **7.2.4 Contrôle des eaux souterraines**

Compte tenu de la nature argileuse et très peu perméable des sols en place, nous ne prévoyons pas de problème majeur d'eau souterraine lors des travaux de construction.

Toutefois, des infiltrations causées par des eaux de ruissellement ou par des nappes d'eau occluses au sein des couches superficielles de remblai pourraient survenir au cours des excavations, dépendant des conditions climatiques et/ou de la période de l'année à laquelle les travaux seront réalisés.

Nous sommes d'avis que les venues d'eau devraient pouvoir être éliminées au moyen de tranchées et de pompes judicieusement placées, c'est-à-dire en périphérie des fouilles, près des sources d'infiltration.

### **7.3 Tranchées pour l'installation des câbles électriques**

#### **7.3.1 Excavation**

Dans la mesure où les tranchées pour l'installation des nouveaux câbles électriques n'excèdent pas 2 m de profondeur, les recommandations et commentaires déjà formulés à la section 7.2.1 demeurent applicables.

Si l'utilisation d'une boîte de tranchée est prévue, il est à rappeler qu'elle est conçue uniquement pour assurer la sécurité des travailleurs en cas de déplacement de sols. Il faut comprendre que son emploi ne garantit pas la stabilité des parois d'excavation surtout si ces dernières ont des inclinaisons plus raides que celles indiquées dans le paragraphe suivant. La stabilité des parois doit donc être vérifiée par un ingénieur spécialisé en géotechnique, afin d'éviter une rupture qui peut entraîner la boîte de tranchée.

### **7.3.2 Assise de la conduite et remblayage**

Les assises des câbles électriques, de même que le remblayage des tranchées (nature des matériaux utilisés, épaisseurs des couches, degré de compactage, etc.), devront être réalisés en respectant les exigences du concepteur.

Les sols qui seront excavés sont à prédominance argileuse et leur réutilisation comme matériau de remblai sera fonction du degré de compactage à atteindre. L'argile silteuse naturelle grise, saturée et de consistance ferme ne pourra pas être réutilisée car elle est impossible à compacter. On pourra toutefois envisager la réutilisation des remblais superficiels moins humides, à condition que ces derniers puissent être densifiés au moyen de rouleaux lisses sans vibration, ou encore au moyen d'un équipement de type « pied de mouton ».

### **7.3.3 Contrôle des eaux souterraines**

Nous ne prévoyons pas de problème majeur d'eau souterraine lors des travaux de tranchées pour les câbles souterrains. Toutefois, des infiltrations causées par des eaux de ruissellement ou par des nappes d'eau occluses au sein des couches superficielles de sol pourraient survenir au cours des excavations, dépendant des conditions climatiques et/ou de la période de l'année à laquelle les travaux seront réalisés.

Nous sommes d'avis que les venues d'eau devraient pouvoir être éliminées au moyen de tranchées et de pompes judicieusement placées, c'est-à-dire en périphérie des fouilles, près des sources d'infiltration.

## **7.4 Recommandations générales de construction**

### **7.4.1 Sensibilité du sol au remaniement**

Compte tenu de sa teneur élevée en silt, le dépôt d'argile sera sensible au remaniement causé par les intempéries (pluie, gel, fonte des neiges) ou par la circulation des ouvriers et de la machinerie de chantier.

Un remaniement excessif des surfaces d'assise pourrait entraîner une perte de résistance des sols et, subséquent, des tassements dépassant l'amplitude prévue. Il pourrait être requis de prévoir des dalles de propreté (béton maigre) pour éviter le remaniement des sols au fond des excavations.

### **7.4.2 Surveillance et inspections des travaux**

Durant les travaux de construction, il est recommandé d'effectuer un suivi géotechnique et qualitatif des principales phases des travaux dont:

- ♦ l'inspection des travaux d'excavation et de fondation par un personnel compétent en géotechnique, pour s'assurer que les semelles soient placées sur un sol conforme, capable de supporter les pressions de la structure dans des conditions sécuritaires;
- ♦ la supervision des opérations de remblayage et de compactage, de façon à s'assurer que des matériaux conformes soient employés et que les degrés de compactage demandés au devis soient effectivement atteints.

### **7.4.3 Conditions hivernales**

La pénétration du gel dans le sol peut causer des problèmes aux structures. Pendant la construction, les sols de fondation exposés doivent être convenablement protégés contre les effets du gel au moyen de matériaux isolants, tels que de la paille, de l'isolant rigide, des abris chauffés.

## 8.0 Portée et limitations de l'étude

---

Le présent rapport s'adresse exclusivement à la firme BPR inc. et aux autres parties identifiées explicitement dans ce rapport et l'utilisation de celui-ci par une tierce partie est interdite, sans le consentement écrit d'**Inspec-Sol** au préalable.

En émettant le présent rapport, **Inspec-Sol** affirme être l'auteur de l'étude géotechnique pour le projet tel que décrit. Ce rapport est un document professionnel et doit demeurer la propriété exclusive d'**Inspec-Sol**. Toute réutilisation ou redistribution non autorisée du rapport constitue un risque qui incombe uniquement au Client et à son destinataire et pour lequel **Inspec-Sol** ne peut être tenue responsable. Le Client assumera la responsabilité de défendre, d'indemniser, ainsi que de dégager **Inspec-Sol** de toute responsabilité résultant de la distribution non autorisée du rapport par le Client. Le rapport doit être pris comme un tout et doit inclure tous les plans et annexes correspondants. Aucune partie du rapport ne peut être utilisée séparément.

Les recommandations formulées dans ce rapport sont basées sur notre compréhension actuelle du projet ainsi que sur l'utilisation, la topographie et les conditions actuelles du site, de même que sur la portée du mandat accordé par le Client et décrit dans le rapport. L'étude a été effectuée conformément aux règles et aux méthodes généralement reconnues par les professionnels en géotechnique qui pratiquent dans les mêmes conditions et la même région, et aucune autre interprétation n'est permise. Tout usage que pourrait en faire une tierce partie ou toute décision basée sur son contenu, prise par cette tierce partie, est la responsabilité de cette dernière.

Tous les détails de conception et de construction sont rarement connus à la fin de l'étude géotechnique, et peuvent être modifiés en cours de projet. Les commentaires et recommandations présentés dans le rapport sont basés sur les résultats de notre étude et compréhension du projet tels que définis au moment de l'étude. Les services d'**Inspec-Sol** devraient être retenus pour revoir ces recommandations et commentaires lorsque les plans et devis seront terminés. Sans cette révision, **Inspec-Sol** ne pourra être tenue responsable de tout malentendu par rapport aux recommandations ou à l'application et à l'adaptation de celles-ci dans la conception finale.

Il est recommandé que les services d'**Inspecc-Sol** soient retenus durant la construction de toutes les fondations et durant les travaux de terrassement afin de s'assurer que les conditions du sous-sol sont similaires à celles observées durant l'étude et que nos recommandations sont bien comprises à toutes les étapes de construction.

Il est important de souligner qu'une étude géotechnique consiste en un échantillonnage aléatoire et ponctuel d'un site et que les commentaires et recommandations inclus dans ce rapport sont basés sur les résultats obtenus aux emplacements des sondages réalisés uniquement. Les conditions géologiques présentées aux emplacements des sondages sont celles qui ont été observées au moment de la réalisation des sondages et peuvent toutefois être modifiées de façon significative par des travaux de construction (excavation, drainage, dynamitage) sur le site ou sur les sites adjacents. Elles peuvent aussi être modifiées par l'exposition des sols et du roc à l'humidité, au séchage ou au gel. Les conditions de sol et d'eau souterraine entre les sondages et au-delà de l'endroit investigué peuvent varier autant en plan qu'en profondeur par rapport aux résultats obtenus à l'emplacement des sondages.

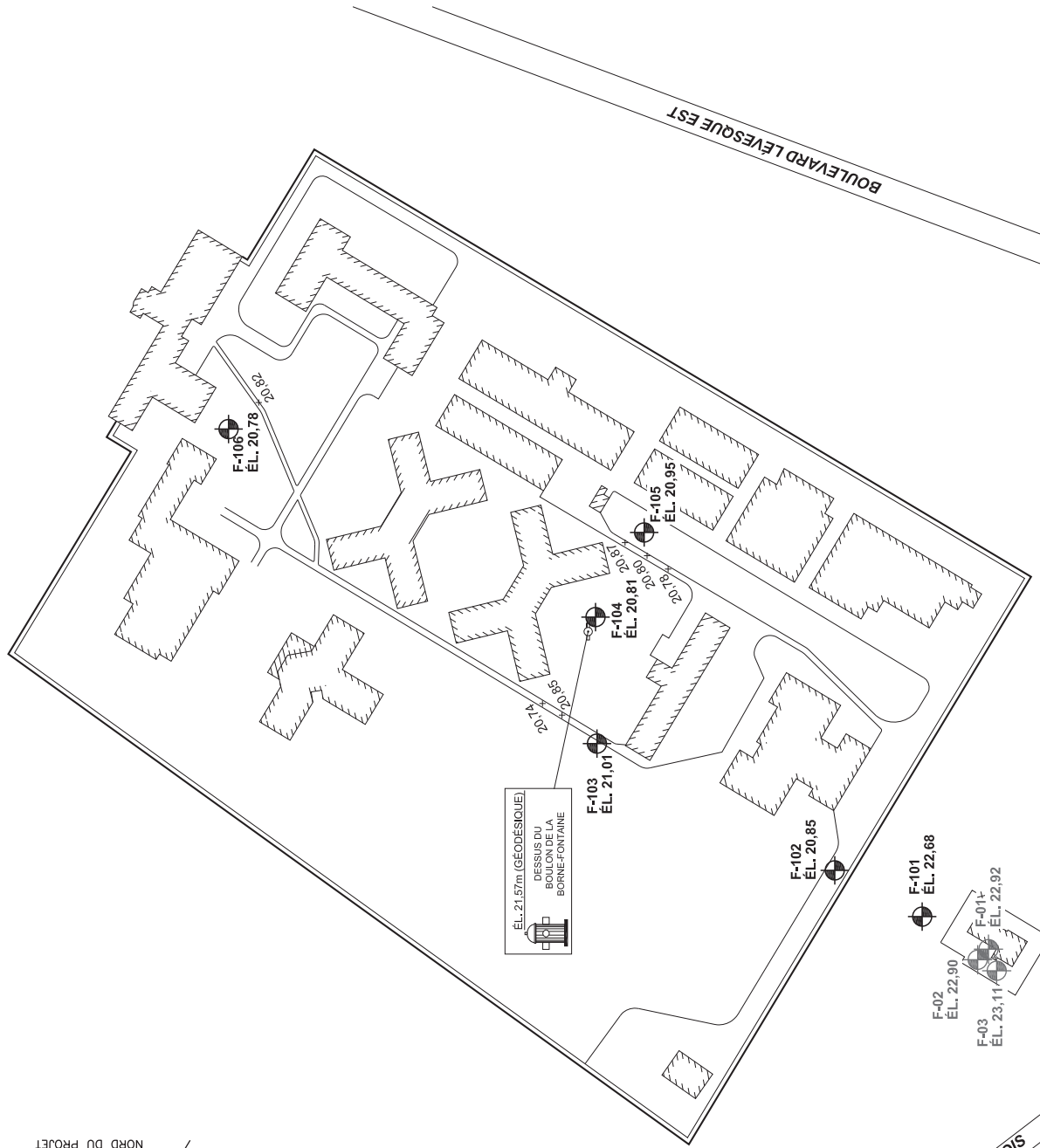
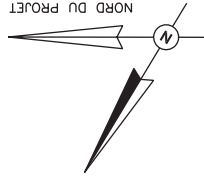
De plus, certaines conditions qui n'ont pu être observées ou prévues au moment de l'étude pourraient être rencontrées durant la construction. Dans l'éventualité où les conditions rencontrées sur le site devaient différer de celles observées à l'emplacement des sondages, nous demandons d'être immédiatement avisés par écrit afin de permettre une réévaluation de nos recommandations. Si des conditions différentes sont identifiées durant la construction, sans égard au degré d'importance des changements, les recommandations émises dans le présent rapport seront considérées comme invalides jusqu'à ce que ces changements soient évalués par **Inspecc-Sol** et que les conclusions du rapport soient modifiées en conséquence ou maintenues par écrit.

RC/sf  
p.j.

## Annexe 1

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- ♦ Localisation des forages (*dessin no M032069-A2-1*)



ÉL. 21,57m (GÉODÉSIQUE)  
DESSUS DU  
BOULON DE LA  
BORNE-FONTAINE

MONTEE ST-FRANÇOIS

BOULEVARD LEVESQUE EST



PLAN CLÉ

**LÉGENDE**

- FORAGE, NUMÉRO ET ÉLEVATION DE LA SURFACE DU SOL (m)  
F-101  
ÉL. 22,68
- FORAGE, NUMÉRO ET ÉLEVATION DE LA SURFACE DU SOL (m)  
F-01  
ÉL. 22,92  
(M032069-A1, JANVIER 2014)
- ÉLEVATION DE LA SURFACE DU SOL (m)  
20,17
- LIMITES DU SITE
- BÂTIMENT EXISTANT

ÉCHELLE GRAPHIQUE:



**INSPEC-SOL**  
INGÉNIERIE ET SOLUTIONS

**BPR INC.**  
ÉTUDE GÉOTECHNIQUE  
NOUVELLES INFRASTRUCTURES  
CENTRE FÉDÉRAL DE FORMATION  
6099, BOULEVARD LEVESQUE EST, LAVAL, QUÉBEC

**LOCALISATION DES FORAGES**

|                           |                     |                                   |
|---------------------------|---------------------|-----------------------------------|
| DESSINÉ PAR:<br>I.C.      | ÉCHELLE:<br>1:2000  | RÉFÉRENCE NO:<br>M032069-A2       |
| VÉRIFIÉ PAR:<br>R.C./L.M. | DATE:<br>AVRIL 2014 | DESSIN NO:<br><b>M032069-A2-1</b> |

**REPERE DE NIVELLEMENT:**  
RTCM-REF 3144 (ANTENNE DU GPS)  
ÉL. 28,742m (GÉODÉSIQUE)

NOTE:  
LES INFORMATIONS RELATIVES AUX CONDITIONS  
EXISTANTES DU SITE PROVIENNENT DE GOOGLE EARTH.



## **Annexe 2**

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- ◆ Rapports de forage

**A- Prélèvement d'échantillons**

Les échantillons de sol sont généralement récupérés dans les forages au moyen soit d'un échantillonneur de type cuillère fendue ou à l'aide de tubes d'acier à paroi mince de type «Shelby». La cuillère fendue procure des échantillons de sol remaniés mais représentatifs de la nature des sols en place. L'enfoncement de l'échantillonneur permet également la réalisation simultanée de l'essai de pénétration standard qui est décrit à la section suivante. Les tubes à paroi mince sont enfoncés délicatement dans le sol et permettent la récupération d'échantillons non remaniés au sein des dépôts argileux, ce qui ne peut être le cas avec la cuillère fendue. Les échantillons de roc sont prélevés au moyen de tubes carottiers munis de trépan diamantés et procurent des échantillons sous forme de carottes dont les diamètres varient en fonction du calibre de l'outil utilisé.

**B- Essai de pénétration standard («SPT»)**

L'essai de pénétration standard consiste à enfoncer dans le sol un échantillonneur normalisé de type cuillère fendue au moyen d'un marteau de 140 lb (63,5 kg) qui le percute après une chute libre de 30 po (76 cm). L'échantillonneur est ainsi foncé dans le sol sur une distance de 18 po (45 cm) et le nombre de coups de marteau nécessaire à l'enfoncement est noté pour chaque intervalle de 6 po (15 cm). Le nombre de coups requis pour enfoncer les derniers 12 po (30 cm) correspond à l'indice de pénétration standard («N»). L'essai est répété à intervalle régulier et les indices obtenus sont des valeurs caractéristiques à partir desquelles on peut estimer la densité, la compressibilité et la résistance des différentes couches de sol traversées. (La procédure est peu applicable cependant aux dépôts argileux).

**C- Essai de pénétration dynamique**

L'essai de pénétration dynamique est similaire à l'essai de pénétration standard, sauf que l'échantillonneur est remplacé par une pointe conique de 10 cm<sup>2</sup> de surface. Le nombre de coups est noté de façon continue pour chaque pi (30 cm) d'enfoncement et les résultats obtenus donnent un relevé systématique de la densité relative des matériaux traversés. L'essai permet également de révéler la profondeur d'une couche de sol très dense ou parfois du socle rocheux.

**Note :** La présence de particules grossières, telles que de gros graviers, des cailloux ou des blocs au sein des couches de sol peut affecter les résultats de l'essai de pénétration standard ou dynamique en produisant des valeurs de résistance anormalement élevées. Dans certains cas, la pénétration peut même devenir impossible et un refus «R» est alors noté.

**D- Essai de résistance au cisaillement**

L'essai de résistance au cisaillement non drainé est réalisé en introduisant dans un sol argileux non remanié un scissomètre constitué de 4 palettes en forme de croix, et en mesurant, à partir de la surface, le couple (force de rotation) nécessaire pour cisailier une surface cylindrique. L'essai est répété à différentes profondeurs et les valeurs de couple obtenues sont converties pour déterminer les résistances au cisaillement non drainé pour chacun des essais effectués. Les profils de résistance recueillis permettent de calculer la capacité portante admissible des dépôts d'argile. L'appareil utilisé pour effectuer les mesures est du type «Nilcon», d'origine scandinave.

**E- Essai de perméabilité (LeFranc)**

Cet essai consiste à déterminer le coefficient de perméabilité K du sol autour d'une poche perméable (la lanterne) de dimensions connues qui a été formée sous le sabot de battage. La méthode retenue est celle à niveau d'eau variable descendant. Les essais de type LeFranc sont réalisés dans des sols à granulométrie moyenne et à perméabilité moyenne.

**F- Essai d'eau sous pression**

L'essai d'eau sous pression dans le rocher à palier de pression unique a pour objectif de déterminer le débit d'eau que peut absorber une zone définie de la masse rocheuse pour un palier de pression unique. Cet essai est exécuté afin d'apprécier l'absorptivité du rocher à l'intérieur de zones définies d'un trou de forage effectué dans le cadre d'une reconnaissance géotechnique. L'essai consiste à injecter de l'eau dans une zone de la masse rocheuse définie par une cavité cylindrique de longueur et de diamètre connus et réalisée par forage. Les débits d'eau absorbés sont mesurés pour une pression unique et pour des durées d'injection définies.

**G- Essai au pressiomètre Ménard**

L'essai pressiométrique, développé par Ménard (1956), est un essai de chargement latéral effectué dans un forage par dilatation d'une sonde cylindrique. L'essai permet de déterminer des caractéristiques effort-déformation du sol, et en particulier le module pressiométrique  $E_M$ , et la pression limite  $p_l$ , qui mesurent la résistance du sol et peuvent être utilisés pour évaluer la capacité portante et le tassement des fondations.

## DESCRIPTION DES SOLS:

Chacune des couches de mort-terrain est décrite selon la terminologie d'usage énumérée ci-après. La compacité des sols granulaires est définie par la valeur de l'indice de pénétration standard "N", et la consistance des sols cohérents par la résistance au cisaillement non drainé à l'état non remanié (Cu).









| CLASSIFICATION (SYSTÈME UNIFIÉ) |                       |
|---------------------------------|-----------------------|
| Argile                          | < 0,002mm             |
| Silt                            | 0,002 à 0,075mm       |
| Sable                           | 0,075 à 4,75mm        |
|                                 | fin 0,075 à 0,425mm   |
|                                 | moyen 0,425mm à 2,0mm |
|                                 | grossier 2,0 à 4,75mm |
| Gravier                         | 4,75 à 75mm           |
|                                 | fin 4,75mm à 19mm     |
|                                 | grossier 19 à 75mm    |
| Cailloux                        | 75 à 300mm            |
| Blocs                           | > 300mm               |

| TERMINOLOGIE                |          |
|-----------------------------|----------|
| "traces"                    | 1 - 10%  |
| "un peu"                    | 10 - 20% |
| adjectif (silteux, sableux) | 20 - 35% |
| "et"                        | 35 - 50% |

| COMPACTITÉ DES<br>SOLS GRANULAIRES | INDICE DE PÉNÉTRATION<br>STANDARD "N"<br>(COUPS/PI. - 300mm) |
|------------------------------------|--|
| Très lâche                         | 0 - 4  |
| Lâche                              | 4 - 10   |
| Compact                            | 10 - 30  |
| Dense                              | 30 - 50  |
| Très dense                         | > 50   |

| CONSISTANCE DES<br>SOLS COHÉRENTS | RÉSISTANCE AU<br>CISAILLEMENT (Cu) |           |
|-----------------------------------|------------------------------------|-----------|
|                                   | (lb./pi. <sup>2</sup> )            | (kPa)     |
| Très molle                        | < 250                              | < 12      |
| Molle                             | 250 - 500                          | 12 - 25   |
| Ferme                             | 500 - 1000                         | 25 - 50   |
| Raide                             | 1000 - 2000                        | 50 - 100  |
| Très raide                        | 2000 - 4000                        | 100 - 200 |
| Dure                              | > 4000                             | > 200     |

| INDICE DE QUALITÉ DU ROC |              |
|--------------------------|--------------|
| VALEUR "RQD" (%)         | QUALIFICATIF |
| < 25                     | très mauvais |
| 25 - 50                  | mauvais      |
| 50 - 75                  | moyen        |
| 75 - 90                  | bon          |
| > 90                     | excellent    |

| SYMBOLES DE LA STRATIGRAPHIE  |   |   |   |
|---|---|---|---|
|  |  |  |  |
| sable   | gravier   | cailloux<br>et blocs  | roc<br>(calcaire)   |
|  |  |  |  |
| silt  | argile  | sol<br>organique  | remblai   |

## ÉCHANTILLONS:

### TYPE ET NUMÉRO

Le type d'échantillonneur utilisé est défini par l'abréviation indiquée ci-après. La numérotation est continue pour chacun des types.

CF: Cuillère fendue

CFE, VRE, TAE: Échantillonnage environnemental

TM: Tube à paroi mince

PS: Tube à piston (Osterberg)

TA: Tarière

CR: Carottier diamanté

VR: Vrac

### RÉCUPÉRATION

La récupération de l'échantillon est le rapport exprimé en pourcentage de la longueur récupérée dans l'échantillonneur à la longueur enfoncée.

### RQD

Les indices de qualité du roc ("Rock Quality Designation" ou "RQD") sont définis comme étant le rapport exprimé en pourcentage de la longueur cumulée de tous les fragments de carottes de 4 pouces (10cm) ou plus à la longueur totale de la course.

## ESSAIS DE CHANTIER:

N: Indice de pénétration standard

R: Refus à l'enfoncement

N<sub>C</sub>: Indice de pénétration dynamique au cône

Cu: Résistance au cisaillement non drainé

Pr: Pressiomètre

k: Perméabilité

ABS: Absorption (eau sous pression)

## ESSAIS DE LABORATOIRE:

I<sub>P</sub>: Indice de plasticité

W<sub>L</sub>: Limite liquide

W<sub>P</sub>: Limite plastique

H: Sédimentométrie

AG: Analyse

granulométrique

A: Limites d'Atterberg

w: Teneur en eau

γ: Poids volumique

C: Consolidation

CS: Cône Suédois

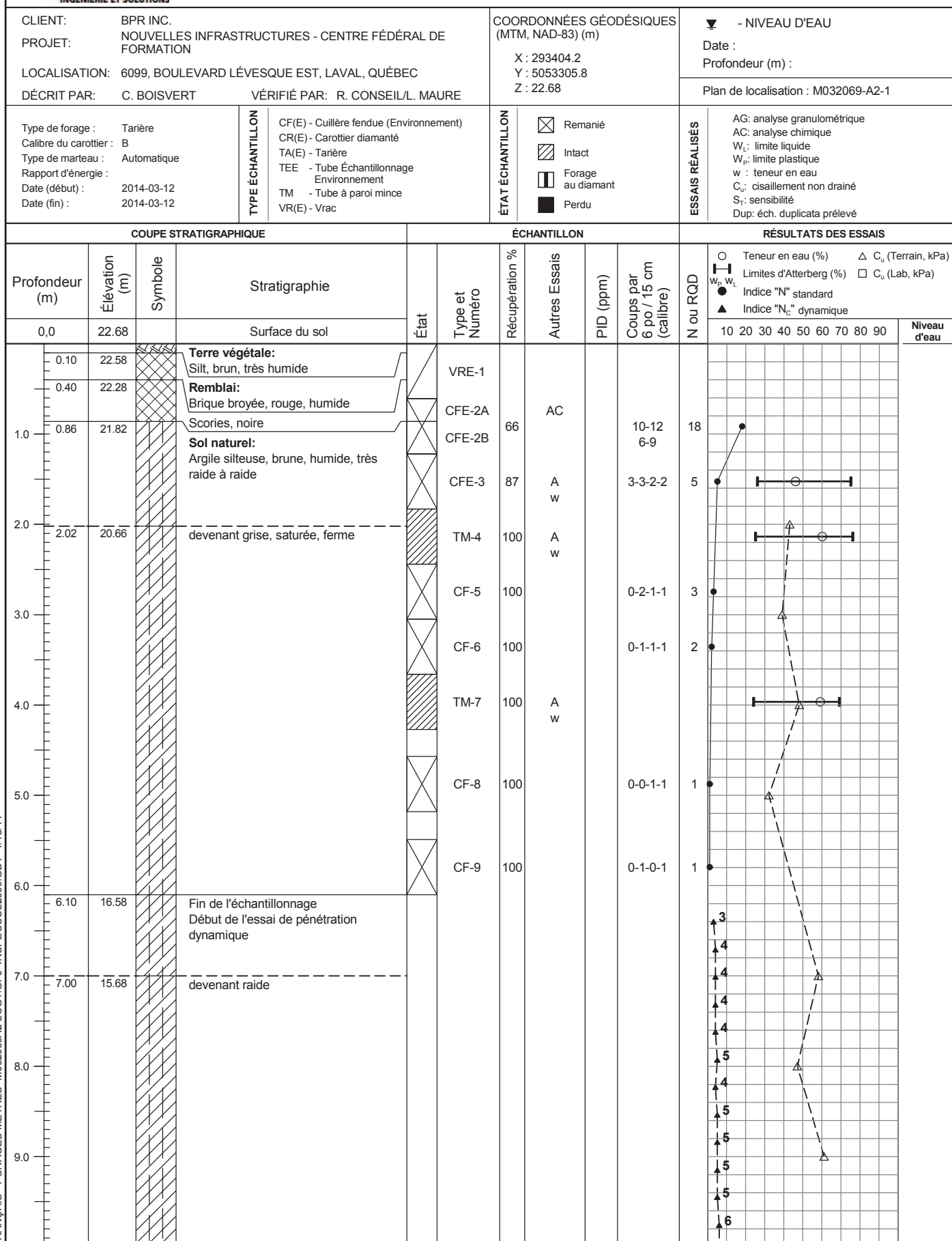
CHIM: Analyse chimique

VO: Vapeur organique

## RAPPORT DE FORAGE

**FORAGE No:**

F-101





## RAPPORT DE FORAGE

FORAGE No: F-101

|   |                  |  |   |   |                             |
|---|------------------|--|---|---|-----------------------------|
| CLIENT: BPR INC.  |                  | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m)  |   | ▼ - NIVEAU D'EAU                            |                             |
| PROJET: NOUVELLES INFRASTRUCTURES - CENTRE FÉDÉRAL DE FORMATION |                  | X : 293404.2<br>Y : 5053305.8<br>Z : 22.68 |   | Date :                                      |                             |
| LOCALISATION: 6099, BOULEVARD LÉVESQUE EST, LAVAL, QUÉBEC       |                  |  |   | Profondeur (m) :                            |                             |
| DESCRIT PAR: C. BOISVERT  |                  | VÉRIFIÉ PAR: R. CONSEIL/L. MAURE           |   | Plan de localisation : M032069-A2-1         |                             |
| Type de forage : Tarière  | TYPE ÉCHANTILLON | CF(E) - Cuillère fendue (Environnement)    | ÉTAT ÉCHANTILLON  | <input checked="" type="checkbox"/> Remanié | ESSAIS RÉALISÉS             |
| Calibre du carottier : B  |                  | CR(E) - Carottier diamanté                 |   | <input checked="" type="checkbox"/> Intact  |                             |
| Type de marteau : Automatique                                   |                  | TA(E) - Tarière                            |   | <input type="checkbox"/> Forage au diamant  |                             |
| Rapport d'énergie :   |                  | TEE - Tube Échantillonnage Environnement   |   | <input checked="" type="checkbox"/> Perdu   |                             |
| Date (début) : 2014-03-12                                       |                  | TM - Tube à paroi mince                    |   |   |                             |
| Date (fin) : 2014-03-12   | VR(E) - Vrac     |  |   |   | Dup: éch. duplicata prélevé |
| COUPE STRATIGRAPHIQUE   |                  |  | ÉCHANTILLON   |   |                             |
| Profondeur (m)  | Élévation (m)    | Symbole                                    | Stratigraphie   | État  | Type et Numéro              |
| 0,0   | 22.68            |  | Surface du sol  |   |                             |
| 11.0  |                  |  |   |   |                             |
| 12.0  |                  |  |   |   |                             |
| 13.0  |                  |  |   |   |                             |
| 14.0  |                  |  |   |   |                             |
| 15.0  |                  |  |   |   |                             |
| 16.0  |                  |  |   |   |                             |
| 17.0  |                  |  |   |   |                             |
| 18.0  |                  |  |   |   |                             |
| 18.44   | 4.24             |  | Fin de l'essai de pénétration dynamique   |   |                             |
| 19.0  |                  |  | Fin du forage   |   |                             |
|   |                  |  | RÉSULTATS DES ESSAIS  |   |                             |
|   |                  |  | ○ Teneur en eau (%)    △ C <sub>u</sub> (Terrain, kPa)<br>— W <sub>p</sub> W <sub>L</sub> Limites d'Atterberg (%)    □ C <sub>u</sub> (Lab, kPa)<br>● Indice "N" standard<br>▲ Indice "N <sub>c</sub> " dynamique |   |                             |
|   |                  |  | N ou RQD    10 20 30 40 50 60 70 80 90    Niveau d'eau  |   |                             |
|   |                  |  |   |   |                             |



## RAPPORT DE FORAGE

FORAGE No: F-102

| CLIENT: BPR INC.   |               | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m)   |   | - NIVEAU D'EAU   |                |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
|--|---------------|---|---|--|----------------|----------------------|---------------|-----------|----------------------------------|----------|---|--|--|--|--|--|--|--|--|--|--------------|
| PROJET: NOUVELLES INFRASTRUCTURES - CENTRE FÉDÉRAL DE FORMATION  |               | X : 293424.6<br>Y : 5053344.3<br>Z : 20.85  |   | Date :<br>Profondeur (m) :   |                |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| LOCALISATION: 6099, BOULEVARD LÉVESQUE EST, LAVAL, QUÉBEC  |               |   |   | Plan de localisation : M032069-A2-1  |                |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| DESCRIT PAR: C. BOISVERT   |               | VÉRIFIÉ PAR: R. CONSEIL/L. MAURE  |   |  |                |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| Type de forage : Tarière<br>Calibre du carottier : B<br>Type de marteau : Automatique<br>Rapport d'énergie :<br>Date (début) : 2014-03-14<br>Date (fin) : 2014-03-14 |               | TYPE ÉCHANTILLON<br>CF(E) - Cuillère fendue (Environnement)<br>CR(E) - Carottier diamanté<br>TA(E) - Tarière<br>TEE - Tube Échantillonnage Environnement<br>TM - Tube à paroi mince<br>VR(E) - Vrac | ÉTAT ÉCHANTILLON<br><input checked="" type="checkbox"/> Remanié<br><input checked="" type="checkbox"/> Intact<br><input type="checkbox"/> Forage au diamant<br><input type="checkbox"/> Perdu | ESSAIS RÉALISÉS<br>AG: analyse granulométrique<br>AC: analyse chimique<br>W <sub>L</sub> : limite liquide<br>W <sub>P</sub> : limite plastique<br>w : teneur en eau<br>C <sub>u</sub> : cisaillement non drainé<br>S <sub>r</sub> : sensibilité<br>Dup: éch. duplicata prélevé |                |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| COUPE STRATIGRAPHIQUE  |               |   |   | ÉCHANTILLON  |                | RÉSULTATS DES ESSAIS |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| Profondeur (m)   | Élévation (m) | Symbole   | Stratigraphie   | État   | Type et Numéro | Récupération %       | Autres Essais | PID (ppm) | Coups par 6 po / 15 cm (calibre) | N ou RQD | ○ Teneur en eau (%)    △ C <sub>u</sub> (Terrain, kPa)<br>— Limites d'Atterberg (%)    □ C <sub>u</sub> (Lab, kPa)<br>● Indice "N" standard<br>▲ Indice "N <sub>c</sub> " dynamique |  |  |  |  |  |  |  |  |  | Niveau d'eau |
| 0.0  | 20.85         |   | Surface du sol  |  |                |                      |               |           |                                  |          | 10 20 30 40 50 60 70 80 90  |  |  |  |  |  |  |  |  |  |              |
| 0.13   | 20.72         |   | Enrobé bitumineux (130mm)   |  | VRE-1          |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   | <b>Fondation granulaire:</b><br>Pierre concassée (20-0mm), grise, gelée (compacte)  |  | CFE-2A         | 100                  |               |           | 16-34<br>25-17                   | 59       |   |  |  |  |  |  |  |  |  |  |              |
| 1.0  | 19.74         |   | <b>Sol naturel:</b><br>Argile silteuse, grise, très humide, raide   |  | CFE-2B         |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   | devenant saturée, ferme   |  | CFE-3          | 79                   | AC            |           | 4-2-2-2                          | 4        |   |  |  |  |  |  |  |  |  |  |              |
| 2.0  | 19.02         |   |   |  | CF-4           | 100                  |               |           | 2-2-1-1                          | 3        |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   |   |  | CF-5           | 100                  |               |           | 2-2-1-2                          | 3        |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   |   |  | CF-6           | 100                  |               |           | 1-2-1-2                          | 3        |   |  |  |  |  |  |  |  |  |  |              |
| 4.0  |               |   |   |  | CF-7           | 100                  |               |           | 2-1-2-2                          | 3        |   |  |  |  |  |  |  |  |  |  |              |
| 4.27   | 16.58         |   | Fin du forage   |  |                |                      |               |           |                                  |          |   |  |  |  |  |  |  |  |  |  |              |



## RAPPORT DE FORAGE

FORAGE No:

F-103

|   |                  |  |                  |   |                 |  |
|---|------------------|--|------------------|---|-----------------|--|
| CLIENT: BPR INC.  |                  | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m)  |                  | - NIVEAU D'EAU                              |                 |  |
| PROJET: NOUVELLES INFRASTRUCTURES - CENTRE FÉDÉRAL DE FORMATION |                  | X : 293480.4<br>Y : 5053449.1<br>Z : 21.01 |                  | Date :                                      |                 |  |
| LOCALISATION: 6099, BOULEVARD LÉVESQUE EST, LAVAL, QUÉBEC       |                  |  |                  | Profondeur (m) :                            |                 |  |
| DESCRIT PAR: C. BOISVERT  |                  | VÉRIFIÉ PAR: R. CONSEIL/L. MAURE           |                  | Plan de localisation : M032069-A2-1         |                 |  |
| Type de forage : Tarière  | TYPE ÉCHANTILLON | CF(E) - Cuillère fendue (Environnement)    | ÉTAT ÉCHANTILLON | <input checked="" type="checkbox"/> Remanié | ESSAIS RÉALISÉS | AG: analyse granulométrique              |
| Calibre du carottier : B  |                  | CR(E) - Carottier diamanté                 |                  | <input checked="" type="checkbox"/> Intact  |                 | AC: analyse chimique                     |
| Type de marteau : Automatique                                   |                  | TA(E) - Tarière                            |                  | <input type="checkbox"/> Forage au diamant  |                 | W <sub>L</sub> : limite liquide          |
| Rapport d'énergie :   |                  | TEE - Tube Échantillonnage Environnement   |                  | <input type="checkbox"/> Perdu              |                 | W <sub>p</sub> : limite plastique        |
| Date (début) : 2014-03-14                                       |                  | TM - Tube à paroi mince                    |                  |   |                 | w : teneur en eau                        |
| Date (fin) : 2014-03-14   | VR(E) - Vrac     |  |                  |   |                 | C <sub>u</sub> : cisaillement non drainé |
|   |                  |  |                  |   |                 | S <sub>r</sub> : sensibilité             |
|   |                  |  |                  |   |                 | Dup: éch. duplicata prélevé              |

| COUPE STRATIGRAPHIQUE |               |         |   | ÉCHANTILLON |                |                |               | RÉSULTATS DES ESSAIS |                                  |          |  |    |    |    |    |    |    |    |    |  |              |
|-----------------------|---------------|---------|---|-------------|----------------|----------------|---------------|----------------------|----------------------------------|----------|--|----|----|----|----|----|----|----|----|--|--------------|
| Profondeur (m)        | Élévation (m) | Symbole | Stratigraphie   | État        | Type et Numéro | Récupération % | Autres Essais | PID (ppm)            | Coups par 6 po / 15 cm (calibre) | N ou RQD | <div> <input type="checkbox"/> Teneur en eau (%)    <input type="checkbox"/> C<sub>u</sub> (Terrain, kPa)         </div> <div> <input type="checkbox"/> Limites d'Atterberg (%)    <input type="checkbox"/> C<sub>u</sub> (Lab, kPa)         </div> <div> <input type="checkbox"/> Indice "N" standard         </div> <div> <input type="checkbox"/> Indice "N<sub>c</sub>" dynamique         </div> |    |    |    |    |    |    |    |    |  | Niveau d'eau |
| 0,0                   | 21.01         |         | Surface du sol  |             |                |                |               |                      |                                  |          | 10   | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |  |              |
|                       |               |         | <b>Remblai:</b><br>Silt sableux, brun, très humide, compact               |             | VRE-1          |                | AC            |                      |                                  |          |  |    |    |    |    |    |    |    |    |  |              |
| 0.50                  | 20.51         |         | <b>Sol naturel:</b><br>Argile silteuse, brune, humide, très raide à raide |             | CFE-2          | 74             |               |                      | 5-4-5-5                          | 9        |  |    |    |    |    |    |    |    |    |  |              |
| 1.0                   |               |         |   |             | CFE-3          | 84             |               |                      | 3-2-2-2                          | 4        |  |    |    |    |    |    |    |    |    |  |              |
| 2.0                   |               |         |   |             | CF-4           | 100            |               |                      | 2-1-2-1                          | 3        |  |    |    |    |    |    |    |    |    |  |              |
| 2.25                  | 18.76         |         | devenant grise, saturée, ferme  |             | CF-5           | 100            |               |                      | 1-1-1-1                          | 2        |  |    |    |    |    |    |    |    |    |  |              |
| 3.0                   |               |         |   |             | CF-6           | 100            |               |                      | 1-2-1-1                          | 3        |  |    |    |    |    |    |    |    |    |  |              |
| 4.0                   |               |         |   |             | CF-7           | 66             |               |                      | 1-1-1-1                          | 2        |  |    |    |    |    |    |    |    |    |  |              |
| 4.27                  | 16.74         |         | Fin du forage   |             |                |                |               |                      |                                  |          |  |    |    |    |    |    |    |    |    |  |              |
| 5.0                   |               |         |   |             |                |                |               |                      |                                  |          |  |    |    |    |    |    |    |    |    |  |              |
| 6.0                   |               |         |   |             |                |                |               |                      |                                  |          |  |    |    |    |    |    |    |    |    |  |              |
| 7.0                   |               |         |   |             |                |                |               |                      |                                  |          |  |    |    |    |    |    |    |    |    |  |              |
| 8.0                   |               |         |   |             |                |                |               |                      |                                  |          |  |    |    |    |    |    |    |    |    |  |              |
| 9.0                   |               |         |   |             |                |                |               |                      |                                  |          |  |    |    |    |    |    |    |    |    |  |              |



## RAPPORT DE FORAGE

FORAGE No: F-104

| CLIENT: BPR INC.   |               | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m)   |   | - NIVEAU D'EAU   |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
|--|---------------|---|---|--|----------------|----------------|---------------|----------------------|----------------------------------|----------|---|--|--|--|--|--|--|--|--|--|--------------|
| PROJET: NOUVELLES INFRASTRUCTURES - CENTRE FÉDÉRAL DE FORMATION  |               | X : 293536.1<br>Y : 5053449.7<br>Z : 20.81  |   | Date :   |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| LOCALISATION: 6099, BOULEVARD LÉVESQUE EST, LAVAL, QUÉBEC  |               |   |   | Profondeur (m) :   |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| DÉCRIT PAR: C. BOISVERT  |               | VÉRIFIÉ PAR: R. CONSEIL/L. MAURE  |   | Plan de localisation : M032069-A2-1  |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| Type de forage : Tarière<br>Calibre du carottier : B<br>Type de marteau : Automatique<br>Rapport d'énergie :<br>Date (début) : 2014-03-14<br>Date (fin) : 2014-03-14 |               | TYPE ÉCHANTILLON<br>CF(E) - Cuillère fendue (Environnement)<br>CR(E) - Carottier diamanté<br>TA(E) - Tarière<br>TEE - Tube Échantillonnage Environnement<br>TM - Tube à paroi mince<br>VR(E) - Vrac | ÉTAT ÉCHANTILLON<br><input checked="" type="checkbox"/> Remanié<br><input checked="" type="checkbox"/> Intact<br><input type="checkbox"/> Forage au diamant<br><input type="checkbox"/> Perdu | ESSAIS RÉALISÉS<br>AG: analyse granulométrique<br>AC: analyse chimique<br>W <sub>L</sub> : limite liquide<br>W <sub>p</sub> : limite plastique<br>w : teneur en eau<br>C <sub>u</sub> : cisaillement non drainé<br>S <sub>r</sub> : sensibilité<br>Dup: éch. duplicata prélevé |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| COUPE STRATIGRAPHIQUE  |               |   |   | ÉCHANTILLON  |                |                |               | RÉSULTATS DES ESSAIS |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| Profondeur (m)   | Élévation (m) | Symbole   | Stratigraphie   | État   | Type et Numéro | Récupération % | Autres Essais | PID (ppm)            | Coups par 6 po / 15 cm (calibre) | N ou RQD | ○ Teneur en eau (%)    △ C <sub>u</sub> (Terrain, kPa)<br>— Limites d'Atterberg (%)    □ C <sub>u</sub> (Lab, kPa)<br>● Indice "N" standard<br>▲ Indice "N <sub>c</sub> " dynamique |  |  |  |  |  |  |  |  |  | Niveau d'eau |
| 0,0  | 20.81         |   | Surface du sol  |  |                |                |               |                      |                                  |          | 10 20 30 40 50 60 70 80 90  |  |  |  |  |  |  |  |  |  |              |
| 1.0  |               |   | Remblai:<br>Argile silteuse (remaniée), brune, humide, raide.<br>Présence de débris (mâchefer)  |  | VRE-1          |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   |   |  | CFE-2          | 57             |               |                      | 3-2-3-2                          | 5        |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   |   |  | CFE-3          | 46             | AC            |                      | 3-2-3-3                          | 5        |   |  |  |  |  |  |  |  |  |  |              |
| 2.0  | 2.10          | 18.71   | devenant très humide  |  | CFE-4          | 70             |               |                      | 2-2-1-2                          | 3        |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   |   |  | CFE-5          | 74             |               |                      | 2-2-2-2                          | 4        |   |  |  |  |  |  |  |  |  |  |              |
| 3.0  | 2.99          | 17.82   | Sol naturel:<br>Argile silteuse, grise, très humide à saturée, ferme  |  | CFE-6          | 62             |               |                      | 1-2-1-1                          | 3        |   |  |  |  |  |  |  |  |  |  |              |
| 4.0  |               |   |   |  | TM-7           | 100            |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
|  |               |   |   |  | CF-8           | 100            |               |                      | 1-1-1-1                          | 2        |   |  |  |  |  |  |  |  |  |  |              |
| 5.0  | 4.88          | 15.93   | Fin du forage   |  |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| 6.0  |               |   |   |  |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| 7.0  |               |   |   |  |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| 8.0  |               |   |   |  |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |
| 9.0  |               |   |   |  |                |                |               |                      |                                  |          |   |  |  |  |  |  |  |  |  |  |              |





## RAPPORT DE FORAGE

FORAGE No:

F-105

| CLIENT: BPR INC.   |               | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m)   |   | - NIVEAU D'EAU   |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
|--|---------------|---|---|--|----------------|----------------|----------------------|-----------|----------------------------------|----------|---|--------------|--|--|--|--|--|--|--|--|
| PROJET: NOUVELLES INFRASTRUCTURES - CENTRE FÉDÉRAL DE FORMATION  |               | X : 293573.4<br>Y : 5053428.3<br>Z : 20.95  |   | Date :   |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| LOCALISATION: 6099, BOULEVARD LÉVESQUE EST, LAVAL, QUÉBEC  |               |   |   | Profondeur (m) :   |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| DESCRIT PAR: C. BOISVERT   |               | VÉRIFIÉ PAR: R. CONSEIL/L. MAURE  |   | Plan de localisation : M032069-A2-1  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| Type de forage : Tarière<br>Calibre du carottier : B<br>Type de marteau : Automatique<br>Rapport d'énergie :<br>Date (début) : 2014-03-14<br>Date (fin) : 2014-03-14 |               | TYPE ÉCHANTILLON<br>CF(E) - Cuillère fendue (Environnement)<br>CR(E) - Carottier diamanté<br>TA(E) - Tarière<br>TEE - Tube Échantillonnage Environnement<br>TM - Tube à paroi mince<br>VR(E) - Vrac | ÉTAT ÉCHANTILLON<br><input checked="" type="checkbox"/> Remanié<br><input checked="" type="checkbox"/> Intact<br><input type="checkbox"/> Forage au diamant<br><input type="checkbox"/> Perdu | ESSAIS RÉALISÉS<br>AG: analyse granulométrique<br>AC: analyse chimique<br>W <sub>L</sub> : limite liquide<br>W <sub>p</sub> : limite plastique<br>w : teneur en eau<br>C <sub>u</sub> : cisaillement non drainé<br>S <sub>r</sub> : sensibilité<br>Dup: éch. duplicata prélevé |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| COUPE STRATIGRAPHIQUE  |               |   |   | ÉCHANTILLON  |                |                | RÉSULTATS DES ESSAIS |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| Profondeur (m)   | Élévation (m) | Symbole   | Stratigraphie   | État   | Type et Numéro | Récupération % | Autres Essais        | PID (ppm) | Coups par 6 po / 15 cm (calibre) | N ou RQD | ○ Teneur en eau (%)    △ C <sub>u</sub> (Terrain, kPa)<br>— Limites d'Atterberg (%)    □ C <sub>u</sub> (Lab, kPa)<br>● Indice "N" standard<br>▲ Indice "N <sub>c</sub> " dynamique |              |  |  |  |  |  |  |  |  |
| 0,0  | 20.95         |   | Surface du sol  |  |                |                |                      |           |                                  |          | 10 20 30 40 50 60 70 80 90  | Niveau d'eau |  |  |  |  |  |  |  |  |
| 1.0  |               |   | <b>Remblai:</b><br>Argile silteuse (remaniée), brune, humide, très raide à raide.<br>Présence de débris (bois)  |  | VRE-1          |                | AC                   |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
|  |               |   |   |  | CFE-2          | 33             |                      |           | 4-10-8-2                         | 18       |   |              |  |  |  |  |  |  |  |  |
|  |               |   |   |  | CFE-3          | 51             |                      |           | 2-2-2-2                          | 4        |   |              |  |  |  |  |  |  |  |  |
| 2.0  |               |   |   |  | CFE-4          | 0              |                      |           | 2-2-1-1                          | 3        |   |              |  |  |  |  |  |  |  |  |
| 2.21   | 18.74         |   | <b>Sol naturel:</b><br>Argile silteuse, grise, saturée, ferme   |  | CFE-5          | 100            |                      |           | 1-1-1-2                          | 2        |   |              |  |  |  |  |  |  |  |  |
|  |               |   |   |  | CF-6           | 0              |                      |           | 2-3-2-3                          | 5        |   |              |  |  |  |  |  |  |  |  |
|  |               |   |   |  | CF-7           | 74             |                      |           | 1-1-1-1                          | 2        |   |              |  |  |  |  |  |  |  |  |
| 4.0  |               |   |   |  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| 4.27   | 16.68         |   | Fin du forage   |  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| 5.0  |               |   |   |  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| 6.0  |               |   |   |  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| 7.0  |               |   |   |  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| 8.0  |               |   |   |  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| 9.0  |               |   |   |  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |



## RAPPORT DE FORAGE

FORAGE No: F-106

| CLIENT: BPR INC.   |               | COORDONNÉES GÉODÉSIQUES (MTM, NAD-83) (m)  |  | - NIVEAU D'EAU  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
|--|---------------|--|--|---|----------------|----------------|----------------------|-----------|----------------------------------|----------|---|--------------|--|--|--|--|--|--|--|--|
| PROJET: NOUVELLES INFRASTRUCTURES - CENTRE FÉDÉRAL DE FORMATION  |               | X : 293619.0<br>Y : 5053611.3<br>Z : 20.78   |  | Date :  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| LOCALISATION: 6099, BOULEVARD LÉVESQUE EST, LAVAL, QUÉBEC  |               |  |  | Profondeur (m) :  |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| DÉCRIT PAR: C. BOISVERT  |               | VÉRIFIÉ PAR: R. CONSEIL/L. MAURE   |  | Plan de localisation : M032069-A2-1   |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| Type de forage : Tarière<br>Calibre du carottier : B<br>Type de marteau : Automatique<br>Rapport d'énergie :<br>Date (début) : 2014-03-14<br>Date (fin) : 2014-03-14 |               | <b>TYPE ÉCHANTILLON</b><br>CF(E) - Cuillère fendue (Environnement)<br>CR(E) - Carottier diamanté<br>TA(E) - Tarière<br>TEE - Tube Échantillonnage Environnement<br>TM - Tube à paroi mince<br>VR(E) - Vrac | <b>ÉTAT ÉCHANTILLON</b><br><input checked="" type="checkbox"/> Remanié<br><input checked="" type="checkbox"/> Intact<br><input type="checkbox"/> Forage au diamant<br><input type="checkbox"/> Perdu | <b>ESSAIS RÉALISÉS</b><br>AG: analyse granulométrique<br>AC: analyse chimique<br>W <sub>L</sub> : limite liquide<br>W <sub>p</sub> : limite plastique<br>w : teneur en eau<br>C <sub>u</sub> : cisaillement non drainé<br>S <sub>r</sub> : sensibilité<br>Dup: éch. duplicata prélevé |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| COUPE STRATIGRAPHIQUE  |               |  |  | ÉCHANTILLON   |                |                | RÉSULTATS DES ESSAIS |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| Profondeur (m)   | Élévation (m) | Symbole  | Stratigraphie  | État  | Type et Numéro | Récupération % | Autres Essais        | PID (ppm) | Coups par 6 po / 15 cm (calibre) | N ou RQD | ○ Teneur en eau (%)    △ C <sub>u</sub> (Terrain, kPa)<br>— Limites d'Atterberg (%)    □ C <sub>u</sub> (Lab, kPa)<br>● Indice "N" standard<br>▲ Indice "N <sub>c</sub> " dynamique |              |  |  |  |  |  |  |  |  |
| 0,0  | 20.78         |  | Surface du sol   |   |                |                |                      |           |                                  |          | 10 20 30 40 50 60 70 80 90  | Niveau d'eau |  |  |  |  |  |  |  |  |
| 0.55   | 20.23         |  | Remblai:<br>Argile et silt, brun, humide, gelé<br>Présence de débris (brique rouge)  |   | VRE-1          |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |
| 1.0  |               |  | Sol naturel:<br>Argile silteuse, brune, humide, raide  |   | CFE-2          | 57             | AC                   |           | 2-3-4-4                          | 7        |   |              |  |  |  |  |  |  |  |  |
|  |               |  |  |   | CFE-3          | 100            |                      |           | 2-4-4-5                          | 8        |   |              |  |  |  |  |  |  |  |  |
| 2.0  |               |  |  |   | CFE-4          | 100            |                      |           | 2-3-3-4                          | 6        |   |              |  |  |  |  |  |  |  |  |
|  |               |  |  |   | CFE-5          | 100            |                      |           | 2-2-1-1                          | 3        |   |              |  |  |  |  |  |  |  |  |
| 3.0  | 3.05          | 17.73  | devenant grise, saturée, ferme   |   | CF-6           | 100            |                      |           | 1-1-0-1                          | 1        |   |              |  |  |  |  |  |  |  |  |
| 4.0  |               |  |  |   | CF-7           | 100            |                      |           | 2-1-1-1                          | 2        |   |              |  |  |  |  |  |  |  |  |
| 4.27   | 16.51         |  | Fin du forage  |   |                |                |                      |           |                                  |          |   |              |  |  |  |  |  |  |  |  |

### **Annexe 3**

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- ◆ Résultats des essais géotechniques de laboratoire



#### **Annexe 4**

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- ♦ Certificat d'analyses chimiques (*Maxxam Analytique inc.*)



**GRILLE DE GESTION DES SOLS CONTAMINÉS EXCAVÉS  
INTÉrimAIRE (26 JANVIER 1999)  
DU MINISTÈRE DU DÉVELOPPEMENT  
DURABLE DE L'ENVIRONNEMENT ET DES PARCS**

| NIVEAU DE CONTAMINATION | OPTIONS DE GESTION   |
|-------------------------|--|
| < A                     | 1. Utilisation sans restriction.   |
| <b>Plage A – B</b>      | 1. Utilisation comme matériaux de remblayage sur les terrains contaminés à vocation résidentielle en voie de réhabilitation* ou sur tout terrain à vocation commerciale ou industrielle, à la condition que leur utilisation n'ait pas pour effet d'augmenter la contamination** du terrain récepteur et, de plus, pour un terrain à vocation résidentielle, que les sols n'émettent pas d'odeurs d'hydrocarbures perceptibles.<br>2. Utilisation comme matériaux de recouvrement journalier dans un lieu d'enfouissement sanitaire (LES).<br>3. Utilisation comme matériaux de recouvrement final dans un LES à la condition qu'ils soient recouverts de 15 cm de sol propre. |
| <b>Plage B – C</b>      | 1. Décontamination de façon optimale*** dans un lieu de traitement autorisé et gestion selon le résultat obtenu.<br>2. Utilisation comme matériaux de remblayage sur le terrain d'origine à la condition que leur utilisation n'ait pas pour effet d'augmenter la contamination** du terrain et que l'usage de ce terrain soit à vocation commerciale ou industrielle.<br>3. Utilisation comme matériaux de recouvrement journalier dans un LES.   |
| > C                     | 1. Décontamination de façon optimale*** dans un lieu de traitement autorisé et gestion selon le résultat obtenu.<br>2. Si l'option précédente est impraticable, dépôt définitif dans un lieu d'enfouissement sécuritaire autorisé pour recevoir des sols.  |

\* Les terrains contaminés à vocation résidentielle en voie de réhabilitation sont ceux voués à un usage résidentiel dont une caractérisation a démontré une contamination supérieure au critère B et où l'apport de sols en provenance de l'extérieur sera requis lors des travaux de restauration.

\*\* La contamination réfère à la nature des contaminants et à leur concentration.

\*\*\* Le traitement optimal est défini pour l'ensemble des contaminants par l'atteinte du critère B ou la réduction de 80% de la concentration initiale et pour les volatils par l'atteinte du critère B.

**Principes de base**

1. La qualité des sols propres doit être maintenue et protégée.
2. La décontamination des sols contaminés excavés est privilégiée.
3. La dilution est inacceptable.
4. L'objectif de décontamination est la réutilisation des sols.

Votre # du projet: M032069-A2  
 Adresse du site: PRISON LAVAL  
 Votre # Bordereau: e869049, e-869049

**Attention: R Conseil**

INSPEC-SOL INC  
 MONTRÉAL  
 4600 COTE VERTU  
 SUITE 200  
 VILLE ST-LAURENT, PQ  
 H4S 1C7

**Date du rapport: 2014/03/20**

# Rapport: R1842373  
 Version: 1

**CERTIFICAT D'ANALYSES**

**# DE DOSSIER MAXXAM: B413497**

**Reçu: 2014/03/17, 13:30**

Matrice: SOL  
 Nombre d'échantillons reçus: 6

| Analyses                                 | Quantité | Date de l'extraction | Date Analyisé | Méthode de laboratoire | Référence Primaire  |
|--|----------|----------------------|---------------|------------------------|---------------------|
| Hydrocarbures pétroliers (C10-C50)*      | 4        | 2014/03/17           | 2014/03/17    | STL SOP-00172          | MA. 416-C10-C50 1.0 |
| Hydrocarbures pétroliers (C10-C50)*      | 1        | 2014/03/17           | 2014/03/18    | STL SOP-00172          | MA. 416-C10-C50 1.0 |
| Fluorures lixiviés*                      | 1        | N/A                  | 2014/03/20    | STL SOP-00038          | SM 4500-F-C         |
| Métaux lixiviés*                         | 1        | 2014/03/19           | 2014/03/19    | STL SOP-00006          | MA.200- Mét 1.2     |
| Métaux extractibles totaux par ICP*      | 5        | 2014/03/17           | 2014/03/17    | STL SOP-00006          | MA.200- Mét 1.2     |
| Nitrate et/ou Nitrite lixiviés*          | 1        | N/A                  | 2014/03/19    | STL SOP-00014          | MA. 300 - Ions 1.3  |
| Hydrocarbures aromatiques polycycliques* | 5        | 2014/03/17           | 2014/03/17    | STL SOP-00178          | MA. 400 - HAP 1.1   |
| Lix.-espèces inorg.(TCLP, EPA 1311)*     | 1        | 2014/03/18           | 2014/03/18    | STL SOP-00024          | MA.100-Lix. com.1.1 |

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

\* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDEFP.

clé de cryptage



Karima Dlimi

20 Mar 2014 14:54:51 -04:00

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Karima Dlimi, B.Sc., chimiste, Chargée de projets

Email: KDlimi@maxxam.ca

Phone# (514)448-9001 Ext:4270

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B413497  
Date du rapport: 2014/03/20

INSPEC-SOL INC  
Votre # du projet: M032069-A2  
Adresse du site: PRISON LAVAL

### HAP PAR GCMS (SOL)

|  |        |     |    |     |            |            |            |            |            |     |         |
|--|--------|-----|----|-----|------------|------------|------------|------------|------------|-----|---------|
| ID Maxxam                              |        |     |    |     | X77752     | X77753     | X77754     | X77755     | X77756     |     |         |
| Date d'échantillonnage                 |        |     |    |     | 2014/03/14 | 2014/03/14 | 2014/03/14 | 2014/03/14 | 2014/03/14 |     |         |
| # Bordereau                            |        |     |    |     | e-869049   | e-869049   | e-869049   | e-869049   | e-869049   |     |         |
|  | UNITÉS | A   | B  | C   | F-02 CFE-3 | F-03 VRE-1 | F-04 CFE-3 | F-05 VRE-1 | F-06 CFE-2 | LDR | Lot CQ  |
| % HUMIDITÉ                             | %      | -   | -  | -   | 35         | 19         | 26         | 16         | 28         | N/A | N/A     |
| <b>HAP</b>                             |        |     |    |     |            |            |            |            |            |     |         |
| Acénaphène                             | mg/kg  | 0.1 | 10 | 100 | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Acénaphthylène                         | mg/kg  | 0.1 | 10 | 100 | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Anthracène                             | mg/kg  | 0.1 | 10 | 100 | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Benzo(a)anthracène                     | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Benzo(a)pyrène                         | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Benzo(b)fluoranthène                   | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Benzo(j)fluoranthène                   | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Benzo(k)fluoranthène                   | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Benzo(c)phénanthrène                   | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Benzo(ghi)peryène                      | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Chrysène                               | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Dibenz(a,h)anthracène                  | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Dibenzo(a,i)pyrène                     | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Dibenzo(a,h)pyrène                     | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Dibenzo(a,l)pyrène                     | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| 7,12-Diméthylbenzanthracène            | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Fluoranthène                           | mg/kg  | 0.1 | 10 | 100 | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Fluorène                               | mg/kg  | 0.1 | 10 | 100 | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Indéno(1,2,3-cd)pyrène                 | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| 3-Méthylcholanthrène                   | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Naphtalène                             | mg/kg  | 0.1 | 5  | 50  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Phénanthrène                           | mg/kg  | 0.1 | 5  | 50  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| Pyrène                                 | mg/kg  | 0.1 | 10 | 100 | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| 2-Méthylnaphtalène                     | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| 1-Méthylnaphtalène                     | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| 1,3-Diméthylnaphtalène                 | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| 2,3,5-Triméthylnaphtalène              | mg/kg  | 0.1 | 1  | 10  | <0.1       | <0.1       | <0.1       | <0.1       | <0.1       | 0.1 | 1282016 |
| <b>Récupération des Surrogates (%)</b> |        |     |    |     |            |            |            |            |            |     |         |
| D10-Anthracène                         | %      | -   | -  | -   | 80         | 88         | 86         | 88         | 84         | N/A | 1282016 |
| D12-Benzo(a)pyrène                     | %      | -   | -  | -   | 76         | 84         | 88         | 86         | 84         | N/A | 1282016 |
| D14-Terphenyl                          | %      | -   | -  | -   | 86         | 90         | 88         | 88         | 86         | N/A | 1282016 |
| D8-Acenaphthylene                      | %      | -   | -  | -   | 80         | 84         | 82         | 84         | 80         | N/A | 1282016 |
| D8-Naphtalène                          | %      | -   | -  | -   | 80         | 84         | 80         | 84         | 80         | N/A | 1282016 |
| LDR = Limite de détection rapportée    |        |     |    |     |            |            |            |            |            |     |         |
| Lot CQ = Lot contrôle qualité          |        |     |    |     |            |            |            |            |            |     |         |
| N/A = Non Applicable                   |        |     |    |     |            |            |            |            |            |     |         |



Dossier Maxxam: B413497  
Date du rapport: 2014/03/20

INSPEC-SOL INC  
Votre # du projet: M032069-A2  
Adresse du site: PRISON LAVAL

### HYDROCARBURES PAR GCFID (SOL)

|  |        |     |     |      |            |            |            |            |            |     |         |
|--|--------|-----|-----|------|------------|------------|------------|------------|------------|-----|---------|
| ID Maxxam                              |        |     |     |      | X77752     | X77753     | X77754     | X77755     | X77756     |     |         |
| Date d'échantillonnage                 |        |     |     |      | 2014/03/14 | 2014/03/14 | 2014/03/14 | 2014/03/14 | 2014/03/14 |     |         |
| # Bordereau                            |        |     |     |      | e-869049   | e-869049   | e-869049   | e-869049   | e-869049   |     |         |
|  | UNITÉS | A   | B   | C    | F-02 CFE-3 | F-03 VRE-1 | F-04 CFE-3 | F-05 VRE-1 | F-06 CFE-2 | LDR | Lot CQ  |
| % HUMIDITÉ                             | %      | -   | -   | -    | 35         | 19         | 26         | 16         | 28         | N/A | N/A     |
| <b>HYDROCARBURES PÉTROLIERS</b>        |        |     |     |      |            |            |            |            |            |     |         |
| Hydrocarbures pétroliers (C10-C50)     | mg/kg  | 300 | 700 | 3500 | <100       | <100       | <100       | <100       | <100       | 100 | 1282012 |
| <b>Récupération des Surrogates (%)</b> |        |     |     |      |            |            |            |            |            |     |         |
| 1-Chlorooctadécane                     | %      | -   | -   | -    | 75         | 77         | 78         | 80         | 76         | N/A | 1282012 |
| LDR = Limite de détection rapportée    |        |     |     |      |            |            |            |            |            |     |         |
| Lot CQ = Lot contrôle qualité          |        |     |     |      |            |            |            |            |            |     |         |
| N/A = Non Applicable                   |        |     |     |      |            |            |            |            |            |     |         |

|  |        |     |     |      |                               |     |         |
|--|--------|-----|-----|------|-------------------------------|-----|---------|
| ID Maxxam                              |        |     |     |      | X77756                        |     |         |
| Date d'échantillonnage                 |        |     |     |      | 2014/03/14                    |     |         |
| # Bordereau                            |        |     |     |      | e-869049                      |     |         |
|  | UNITÉS | A   | B   | C    | F-06 CFE-2<br>Dup. de<br>Lab. | LDR | Lot CQ  |
| % HUMIDITÉ                             | %      | -   | -   | -    | 28                            | N/A | N/A     |
| <b>HYDROCARBURES PÉTROLIERS</b>        |        |     |     |      |                               |     |         |
| Hydrocarbures pétroliers (C10-C50)     | mg/kg  | 300 | 700 | 3500 | <100                          | 100 | 1282012 |
| <b>Récupération des Surrogates (%)</b> |        |     |     |      |                               |     |         |
| 1-Chlorooctadécane                     | %      | -   | -   | -    | 73                            | N/A | 1282012 |
| LDR = Limite de détection rapportée    |        |     |     |      |                               |     |         |
| Lot CQ = Lot contrôle qualité          |        |     |     |      |                               |     |         |
| N/A = Non Applicable                   |        |     |     |      |                               |     |         |

Dossier Maxxam: B413497  
Date du rapport: 2014/03/20

INSPEC-SOL INC  
Votre # du projet: M032069-A2  
Adresse du site: PRISON LAVAL

### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

|                                     |        |     |      |      |            |     |                               |     |            |     |            |     |     |         |
|-------------------------------------|--------|-----|------|------|------------|-----|-------------------------------|-----|------------|-----|------------|-----|-----|---------|
| ID Maxxam                           |        |     |      |      | X77752     |     | X77752                        |     | X77753     |     | X77754     |     |     |         |
| Date d'échantillonnage              |        |     |      |      | 2014/03/14 |     | 2014/03/14                    |     | 2014/03/14 |     | 2014/03/14 |     |     |         |
| # Bordereau                         |        |     |      |      | e-869049   |     | e-869049                      |     | e-869049   |     | e-869049   |     |     |         |
|                                     | UNITÉS | A   | B    | C    | F-02 CFE-3 | CR  | F-02 CFE-3<br>Dup. de<br>Lab. | CR  | F-03 VRE-1 | CR  | F-04 CFE-3 | CR  | LDR | Lot CQ  |
| % HUMIDITÉ                          | %      | -   | -    | -    | 35         | N/A | 35                            | N/A | 19         | N/A | 26         | N/A | N/A | N/A     |
| <b>MÉTAUX</b>                       |        |     |      |      |            |     |                               |     |            |     |            |     |     |         |
| Argent (Ag)                         | mg/kg  | 2   | 20   | 40   | <0.5       | N/A | <0.5                          | N/A | <0.5       | N/A | <0.5       | N/A | 0.5 | 1282042 |
| Arsenic (As)                        | mg/kg  | 6   | 30   | 50   | <5         | N/A | <5                            | N/A | <5         | N/A | <5         | N/A | 5   | 1282042 |
| Baryum (Ba)                         | mg/kg  | 200 | 500  | 2000 | 150        | <A  | 150                           | <A  | 58         | <A  | 170        | <A  | 5   | 1282042 |
| Cadmium (Cd)                        | mg/kg  | 1.5 | 5    | 20   | 0.8        | <A  | 0.7                           | <A  | <0.5       | N/A | 0.8        | <A  | 0.5 | 1282042 |
| Chrome (Cr)                         | mg/kg  | 85  | 250  | 800  | 87         | A-B | 89                            | A-B | 29         | <A  | 100        | A-B | 2   | 1282042 |
| Cobalt (Co)                         | mg/kg  | 15  | 50   | 300  | 21         | A-B | 22                            | A-B | 8          | <A  | 23         | A-B | 2   | 1282042 |
| Cuivre (Cu)                         | mg/kg  | 40  | 100  | 500  | 48         | A-B | 49                            | A-B | 13         | <A  | 53         | A-B | 2   | 1282042 |
| Etain (Sn)                          | mg/kg  | 5   | 50   | 300  | <4         | N/A | <4                            | N/A | <4         | N/A | <4         | N/A | 4   | 1282042 |
| Manganèse (Mn)                      | mg/kg  | 770 | 1000 | 2200 | 570        | <A  | 570                           | <A  | 390        | <A  | 680        | <A  | 2   | 1282042 |
| Molybdène (Mo)                      | mg/kg  | 2   | 10   | 40   | <1         | N/A | <1                            | N/A | <1         | N/A | <1         | N/A | 1   | 1282042 |
| Nickel (Ni)                         | mg/kg  | 50  | 100  | 500  | 53         | A-B | 53                            | A-B | 15         | <A  | 62         | A-B | 1   | 1282042 |
| Plomb (Pb)                          | mg/kg  | 50  | 500  | 1000 | 9          | <A  | 9                             | <A  | 7          | <A  | 12         | <A  | 5   | 1282042 |
| Zinc (Zn)                           | mg/kg  | 110 | 500  | 1500 | 93         | <A  | 92                            | <A  | 44         | <A  | 100        | <A  | 10  | 1282042 |
| LDR = Limite de détection rapportée |        |     |      |      |            |     |                               |     |            |     |            |     |     |         |
| Lot CQ = Lot contrôle qualité       |        |     |      |      |            |     |                               |     |            |     |            |     |     |         |
| N/A = Non Applicable                |        |     |      |      |            |     |                               |     |            |     |            |     |     |         |

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### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

|                                     |        |     |      |      |            |     |            |     |     |         |
|-------------------------------------|--------|-----|------|------|------------|-----|------------|-----|-----|---------|
| ID Maxxam                           |        |     |      |      | X77755     |     | X77756     |     |     |         |
| Date d'échantillonnage              |        |     |      |      | 2014/03/14 |     | 2014/03/14 |     |     |         |
| # Bordereau                         |        |     |      |      | e-869049   |     | e-869049   |     |     |         |
|                                     | UNITÉS | A   | B    | C    | F-05 VRE-1 | CR  | F-06 CFE-2 | CR  | LDR | Lot CQ  |
| % HUMIDITÉ                          | %      | -   | -    | -    | 16         | N/A | 28         | N/A | N/A | N/A     |
| <b>MÉTAUX</b>                       |        |     |      |      |            |     |            |     |     |         |
| Argent (Ag)                         | mg/kg  | 2   | 20   | 40   | <0.5       | N/A | <0.5       | N/A | 0.5 | 1282042 |
| Arsenic (As)                        | mg/kg  | 6   | 30   | 50   | <5         | N/A | <5         | N/A | 5   | 1282042 |
| Baryum (Ba)                         | mg/kg  | 200 | 500  | 2000 | 61         | <A  | 170        | <A  | 5   | 1282042 |
| Cadmium (Cd)                        | mg/kg  | 1.5 | 5    | 20   | <0.5       | N/A | 0.9        | <A  | 0.5 | 1282042 |
| Chrome (Cr)                         | mg/kg  | 85  | 250  | 800  | 25         | <A  | 100        | A-B | 2   | 1282042 |
| Cobalt (Co)                         | mg/kg  | 15  | 50   | 300  | 7          | <A  | 23         | A-B | 2   | 1282042 |
| Cuivre (Cu)                         | mg/kg  | 40  | 100  | 500  | 16         | <A  | 50         | A-B | 2   | 1282042 |
| Etain (Sn)                          | mg/kg  | 5   | 50   | 300  | <4         | N/A | <4         | N/A | 4   | 1282042 |
| Manganèse (Mn)                      | mg/kg  | 770 | 1000 | 2200 | 390        | <A  | 630        | <A  | 2   | 1282042 |
| Molybdène (Mo)                      | mg/kg  | 2   | 10   | 40   | <1         | N/A | <1         | N/A | 1   | 1282042 |
| Nickel (Ni)                         | mg/kg  | 50  | 100  | 500  | 17         | <A  | 57         | A-B | 1   | 1282042 |
| Plomb (Pb)                          | mg/kg  | 50  | 500  | 1000 | 13         | <A  | 11         | <A  | 5   | 1282042 |
| Zinc (Zn)                           | mg/kg  | 110 | 500  | 1500 | 44         | <A  | 100        | <A  | 10  | 1282042 |
| LDR = Limite de détection rapportée |        |     |      |      |            |     |            |     |     |         |
| Lot CQ = Lot contrôle qualité       |        |     |      |      |            |     |            |     |     |         |
| N/A = Non Applicable                |        |     |      |      |            |     |            |     |     |         |

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### MÉTAUX LIXIVIÉS (SOL)

|                                     |               |                    |            |               |
|-------------------------------------|---------------|--------------------|------------|---------------|
| ID Maxxam                           |               | X77751             |            |               |
| Date d'échantillonnage              |               | 2014/03/12         |            |               |
| # Bordereau                         |               | e-869049           |            |               |
|                                     | <b>UNITÉS</b> | <b>F-01 CFE-2A</b> | <b>LDR</b> | <b>Lot CQ</b> |
| <b>MÉTAUX</b>                       |               |                    |            |               |
| Arsenic (As)                        | mg/L          | <0.004             | 0.004      | 1282873       |
| Baryum (Ba)                         | mg/L          | 0.18               | 0.005      | 1282873       |
| Bore (B)                            | mg/L          | <0.1               | 0.1        | 1282873       |
| Cadmium (Cd)                        | mg/L          | <0.002             | 0.002      | 1282873       |
| Chrome (Cr)                         | mg/L          | <0.007             | 0.007      | 1282873       |
| Mercure (Hg)                        | mg/L          | <0.01              | 0.01       | 1282873       |
| Plomb (Pb)                          | mg/L          | <0.01              | 0.01       | 1282873       |
| Sélénium (Se)                       | mg/L          | <0.005             | 0.005      | 1282873       |
| Uranium (U)                         | mg/L          | <0.02              | 0.02       | 1282873       |
| LDR = Limite de détection rapportée |               |                    |            |               |
| Lot CQ = Lot contrôle qualité       |               |                    |            |               |

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### PARAMÈTRES CONVENTIONNELS-LIXIVIAT LABO (SOL)

|                                     |               |                    |            |               |
|-------------------------------------|---------------|--------------------|------------|---------------|
| ID Maxxam                           |               | X77751             |            |               |
| Date d'échantillonnage              |               | 2014/03/12         |            |               |
| # Bordereau                         |               | e-869049           |            |               |
|                                     | <b>UNITÉS</b> | <b>F-01 CFE-2A</b> | <b>LDR</b> | <b>Lot CQ</b> |
| <b>CONVENTIONNELS</b>               |               |                    |            |               |
| Fluorure (F)                        | mg/L          | <1                 | 1          | 1283256       |
| Nitrites (N-NO <sub>2</sub> -)      | mg/L          | <0.2               | 0.2        | 1282806       |
| Nitrate(N) et Nitrite(N)            | mg/L          | <0.2               | 0.2        | 1282806       |
| LDR = Limite de détection rapportée |               |                    |            |               |
| Lot CQ = Lot contrôle qualité       |               |                    |            |               |

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### LIXIVIAT (SOL)

|                                   |               |                    |               |
|-----------------------------------|---------------|--------------------|---------------|
| ID Maxxam                         |               | X77751             |               |
| Date d'échantillonnage            |               | 2014/03/12         |               |
| # Bordereau                       |               | e-869049           |               |
|                                   | <b>UNITÉS</b> | <b>F-01 CFE-2A</b> | <b>Lot CQ</b> |
| <b>Lixiviat</b>                   |               |                    |               |
| Poids de l'échantillon (g)        | n/a           | 20.1               | 1282326       |
| pH de l'eau déionisée             | n/a           | 5.75               | 1282326       |
| pH du pré-test                    | n/a           | <1.68              | 1282326       |
| pH final du lixiviat              | n/a           | 5.62               | 1282326       |
| Volume fluide d'extraction 1 (ml) | n/a           | 400                | 1282326       |
| Lot CQ = Lot contrôle qualité     |               |                    |               |

## REMARQUES GÉNÉRALES

État des échantillons à l'arrivée: BON

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

A,B,C,CR: Ces critères proviennent de l'Annexe 2 de la « Politique de protection des sols et de réhabilitation des terrains contaminés ». Pour les analyses de métaux(et métalloïdes) dans les sols, le critère A désigne la « Teneur de fond Secteur Basses-Terres du Saint-Laurent ».

A,B-eau souterraine: A=Critère pour fin de consommation; B=Critère pour la résurgence dans les eaux de surface ou infiltration dans les égouts. Ces références ne sont rapportées qu'à titre indicatif et ne doivent être interprétées dans aucun autre contexte.

- = Ce composé ne fait pas parti de la réglementation.

### HAP PAR GCMS (SOL)

Veillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

### HYDROCARBURES PAR GCFID (SOL)

Veillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).  
Veillez noter que les résultats ont été corrigés pour le blanc de méthode.

### MÉTAUX EXTRACTIBLES TOTAUX (SOL)

Veillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

### MÉTAUX LIXIVIÉS (SOL)

Veillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de lixiviat.

### PARAMÈTRES CONVENTIONNELS-LIXIVIAT LABO (SOL)

Veillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.  
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

Veillez noter que les résultats ci-dessus n'ont pas été corrigés pour le blanc de lixiviat.

### LIXIVIAT (SOL)

Veillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**

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### RAPPORT ASSURANCE QUALITÉ

| Lot AQ/CQ | Init | Type CQ          | Groupe                             | Date Analysé | Valeur | Réc | UNITÉS | Limites CQ |
|-----------|------|------------------|------------------------------------|--------------|--------|-----|--------|------------|
| 1282012   | MP   | Blanc fortifié   | 1-Chlorooctadécane                 | 2014/03/17   |        | 80  | %      | 60 - 120   |
|           |      |                  | Hydrocarbures pétroliers (C10-C50) | 2014/03/17   |        | 83  | %      | 70 - 130   |
| 1282012   | MP   | Blanc de méthode | 1-Chlorooctadécane                 | 2014/03/17   |        | 78  | %      | 60 - 120   |
|           |      |                  | Hydrocarbures pétroliers (C10-C50) | 2014/03/17   | <100   |     | mg/kg  |            |
| 1282016   | AK2  | Blanc fortifié   | D10-Anthracène                     | 2014/03/17   |        | 86  | %      | 50 - 130   |
|           |      |                  | D12-Benzo(a)pyrène                 | 2014/03/17   |        | 90  | %      | 50 - 130   |
|           |      |                  | D14-Terphenyl                      | 2014/03/17   |        | 88  | %      | 50 - 130   |
|           |      |                  | D8-Acenaphthylene                  | 2014/03/17   |        | 80  | %      | 50 - 130   |
|           |      |                  | D8-Naphtalène                      | 2014/03/17   |        | 80  | %      | 50 - 130   |
|           |      |                  | Acénaphène                         | 2014/03/17   |        | 81  | %      | 50 - 130   |
|           |      |                  | Acénaphthylène                     | 2014/03/17   |        | 80  | %      | 50 - 130   |
|           |      |                  | Anthracène                         | 2014/03/17   |        | 84  | %      | 50 - 130   |
|           |      |                  | Benzo(a)anthracène                 | 2014/03/17   |        | 88  | %      | 50 - 130   |
|           |      |                  | Benzo(a)pyrène                     | 2014/03/17   |        | 89  | %      | 50 - 130   |
|           |      |                  | Benzo(b)fluoranthène               | 2014/03/17   |        | 92  | %      | 50 - 130   |
|           |      |                  | Benzo(j)fluoranthène               | 2014/03/17   |        | 93  | %      | 50 - 130   |
|           |      |                  | Benzo(k)fluoranthène               | 2014/03/17   |        | 93  | %      | 50 - 130   |
|           |      |                  | Benzo(c)phénanthrène               | 2014/03/17   |        | 86  | %      | 50 - 130   |
|           |      |                  | Benzo(ghi)pérylène                 | 2014/03/17   |        | 88  | %      | 50 - 130   |
|           |      |                  | Chrysène                           | 2014/03/17   |        | 88  | %      | 50 - 130   |
|           |      |                  | Dibenz(a,h)anthracène              | 2014/03/17   |        | 90  | %      | 50 - 130   |
|           |      |                  | Dibenzo(a,i)pyrène                 | 2014/03/17   |        | 104 | %      | 50 - 130   |
|           |      |                  | Dibenzo(a,h)pyrène                 | 2014/03/17   |        | 116 | %      | 50 - 130   |
|           |      |                  | Dibenzo(a,l)pyrène                 | 2014/03/17   |        | 98  | %      | 50 - 130   |
|           |      |                  | 7,12-Diméthylbenzanthracène        | 2014/03/17   |        | 99  | %      | 50 - 130   |
|           |      |                  | Fluoranthène                       | 2014/03/17   |        | 81  | %      | 50 - 130   |
|           |      |                  | Fluorène                           | 2014/03/17   |        | 81  | %      | 50 - 130   |
|           |      |                  | Indéno(1,2,3-cd)pyrène             | 2014/03/17   |        | 91  | %      | 50 - 130   |
|           |      |                  | 3-Méthylcholanthrène               | 2014/03/17   |        | 103 | %      | 50 - 130   |
|           |      |                  | Naphtalène                         | 2014/03/17   |        | 81  | %      | 50 - 130   |
|           |      |                  | Phénanthrène                       | 2014/03/17   |        | 83  | %      | 50 - 130   |
|           |      |                  | Pyrène                             | 2014/03/17   |        | 84  | %      | 50 - 130   |
|           |      |                  | 2-Méthylnaphtalène                 | 2014/03/17   |        | 87  | %      | 50 - 130   |
|           |      |                  | 1-Méthylnaphtalène                 | 2014/03/17   |        | 76  | %      | 50 - 130   |
|           |      |                  | 1,3-Diméthylnaphtalène             | 2014/03/17   |        | 84  | %      | 50 - 130   |
|           |      |                  | 2,3,5-Triméthylnaphtalène          | 2014/03/17   |        | 87  | %      | 50 - 130   |
| 1282016   | AK2  | Blanc de méthode | D10-Anthracène                     | 2014/03/17   |        | 90  | %      | 50 - 130   |
|           |      |                  | D12-Benzo(a)pyrène                 | 2014/03/17   |        | 92  | %      | 50 - 130   |
|           |      |                  | D14-Terphenyl                      | 2014/03/17   |        | 90  | %      | 50 - 130   |
|           |      |                  | D8-Acenaphthylene                  | 2014/03/17   |        | 84  | %      | 50 - 130   |
|           |      |                  | D8-Naphtalène                      | 2014/03/17   |        | 84  | %      | 50 - 130   |
|           |      |                  | Acénaphène                         | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Acénaphthylène                     | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Anthracène                         | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Benzo(a)anthracène                 | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Benzo(a)pyrène                     | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Benzo(b)fluoranthène               | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Benzo(j)fluoranthène               | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Benzo(k)fluoranthène               | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Benzo(c)phénanthrène               | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Benzo(ghi)pérylène                 | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Chrysène                           | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Dibenz(a,h)anthracène              | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Dibenzo(a,i)pyrène                 | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Dibenzo(a,h)pyrène                 | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Dibenzo(a,l)pyrène                 | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | 7,12-Diméthylbenzanthracène        | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Fluoranthène                       | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Fluorène                           | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Indéno(1,2,3-cd)pyrène             | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | 3-Méthylcholanthrène               | 2014/03/17   | <0.1   |     | mg/kg  |            |
|           |      |                  | Naphtalène                         | 2014/03/17   | <0.1   |     | mg/kg  |            |



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### RAPPORT ASSURANCE QUALITÉ (SUITE)

| Lot AQ/CQ | Init | Type CQ          | Groupe                            | Date Analysé | Valeur              | Réc | UNITÉS | Limites CQ |
|-----------|------|------------------|-----------------------------------|--------------|---------------------|-----|--------|------------|
| 1282042   | KK   | Blanc fortifié   | Phénanthrène                      | 2014/03/17   | <0.1                |     | mg/kg  |            |
|           |      |                  | Pyrène                            | 2014/03/17   | <0.1                |     | mg/kg  |            |
|           |      |                  | 2-Méthylnaphtalène                | 2014/03/17   | <0.1                |     | mg/kg  |            |
|           |      |                  | 1-Méthylnaphtalène                | 2014/03/17   | <0.1                |     | mg/kg  |            |
|           |      |                  | 1,3-Diméthylnaphtalène            | 2014/03/17   | <0.1                |     | mg/kg  |            |
|           |      |                  | 2,3,5-Triméthylnaphtalène         | 2014/03/17   | <0.1                |     | mg/kg  |            |
|           |      |                  | Argent (Ag)                       | 2014/03/17   |                     | 77  | %      | 75 - 125   |
|           |      |                  | Arsenic (As)                      | 2014/03/17   |                     | 93  | %      | 75 - 125   |
|           |      |                  | Baryum (Ba)                       | 2014/03/17   |                     | 96  | %      | 75 - 125   |
|           |      |                  | Cadmium (Cd)                      | 2014/03/17   |                     | 97  | %      | 75 - 125   |
|           |      |                  | Chrome (Cr)                       | 2014/03/17   |                     | 95  | %      | 75 - 125   |
|           |      |                  | Cobalt (Co)                       | 2014/03/17   |                     | 96  | %      | 75 - 125   |
|           |      |                  | Cuivre (Cu)                       | 2014/03/17   |                     | 97  | %      | 75 - 125   |
|           |      |                  | Etain (Sn)                        | 2014/03/17   |                     | 96  | %      | 75 - 125   |
|           |      |                  | Manganèse (Mn)                    | 2014/03/17   |                     | 98  | %      | 75 - 125   |
|           |      |                  | Molybdène (Mo)                    | 2014/03/17   |                     | 94  | %      | 75 - 125   |
|           |      |                  | Nickel (Ni)                       | 2014/03/17   |                     | 97  | %      | 75 - 125   |
|           |      |                  | Plomb (Pb)                        | 2014/03/17   |                     | 97  | %      | 75 - 125   |
|           |      |                  | Zinc (Zn)                         | 2014/03/17   |                     | 98  | %      | 75 - 125   |
| 1282042   | KK   | Blanc de méthode | Argent (Ag)                       | 2014/03/17   | <0.5                |     | mg/kg  |            |
|           |      |                  | Arsenic (As)                      | 2014/03/17   | <5                  |     | mg/kg  |            |
|           |      |                  | Baryum (Ba)                       | 2014/03/17   | <5                  |     | mg/kg  |            |
|           |      |                  | Cadmium (Cd)                      | 2014/03/17   | <0.5                |     | mg/kg  |            |
|           |      |                  | Chrome (Cr)                       | 2014/03/17   | <2                  |     | mg/kg  |            |
|           |      |                  | Cobalt (Co)                       | 2014/03/17   | <2                  |     | mg/kg  |            |
|           |      |                  | Cuivre (Cu)                       | 2014/03/17   | <2                  |     | mg/kg  |            |
|           |      |                  | Etain (Sn)                        | 2014/03/17   | <4                  |     | mg/kg  |            |
|           |      |                  | Manganèse (Mn)                    | 2014/03/17   | <2                  |     | mg/kg  |            |
|           |      |                  | Molybdène (Mo)                    | 2014/03/17   | <1                  |     | mg/kg  |            |
|           |      |                  | Nickel (Ni)                       | 2014/03/17   | <1                  |     | mg/kg  |            |
|           |      |                  | Plomb (Pb)                        | 2014/03/17   | <5                  |     | mg/kg  |            |
|           |      |                  | Zinc (Zn)                         | 2014/03/17   | <10                 |     | mg/kg  |            |
| 1282326   | YM4  | Blanc de méthode | pH de l'eau déionisée             | 2014/03/18   | 5.75                |     | n/a    |            |
|           |      |                  | pH initial                        | 2014/03/18   | 4.90                |     | n/a    |            |
|           |      |                  | pH final du lixiviat              | 2014/03/18   | 4.90                |     | n/a    |            |
|           |      |                  | Volume fluide d'extraction 1 (ml) | 2014/03/18   | 400                 |     | n/a    |            |
|           |      |                  | Nitrites (N-NO <sub>2</sub> -)    | 2014/03/19   | <0.2                |     | mg/L   |            |
| 1282806   | MMF  | BL. LIXIVIAT     | Nitrate(N) et Nitrite(N)          | 2014/03/19   | <0.2                |     | mg/L   |            |
|           |      |                  | Nitrites (N-NO <sub>2</sub> -)    | 2014/03/19   |                     | 106 | %      | 80 - 120   |
| 1282806   | MMF  | Blanc fortifié   | Nitrate(N) et Nitrite(N)          | 2014/03/19   |                     | 104 | %      | 80 - 120   |
|           |      |                  | Arsenic (As)                      | 2014/03/19   | <0.004              |     | mg/L   |            |
| 1282873   | JS2  | BL. LIXIVIAT     | Baryum (Ba)                       | 2014/03/19   | <0.005              |     | mg/L   |            |
|           |      |                  | Bore (B)                          | 2014/03/19   | <0.1                |     | mg/L   |            |
|           |      |                  | Cadmium (Cd)                      | 2014/03/19   | <0.002              |     | mg/L   |            |
|           |      |                  | Chrome (Cr)                       | 2014/03/19   | 0.008,<br>LDR=0.007 |     | mg/L   |            |
|           |      |                  | Mercure (Hg)                      | 2014/03/19   | <0.01               |     | mg/L   |            |
|           |      |                  | Plomb (Pb)                        | 2014/03/19   | <0.01               |     | mg/L   |            |
|           |      |                  | Sélénium (Se)                     | 2014/03/19   | 0.005,<br>LDR=0.005 |     | mg/L   |            |
|           |      |                  | Uranium (U)                       | 2014/03/19   | <0.02               |     | mg/L   |            |
|           |      |                  | Arsenic (As)                      | 2014/03/19   |                     | 105 | %      | 80 - 120   |
|           |      |                  | Baryum (Ba)                       | 2014/03/19   |                     | 105 | %      | 80 - 120   |
| 1282873   | JS2  | Blanc fortifié   | Bore (B)                          | 2014/03/19   |                     | 111 | %      | 80 - 120   |
|           |      |                  | Cadmium (Cd)                      | 2014/03/19   |                     | 104 | %      | 80 - 120   |
|           |      |                  | Chrome (Cr)                       | 2014/03/19   |                     | 101 | %      | 80 - 120   |
|           |      |                  | Mercure (Hg)                      | 2014/03/19   |                     | 112 | %      | 80 - 120   |
|           |      |                  | Plomb (Pb)                        | 2014/03/19   |                     | 104 | %      | 80 - 120   |
|           |      |                  | Sélénium (Se)                     | 2014/03/19   |                     | 103 | %      | 80 - 120   |
|           |      |                  | Uranium (U)                       | 2014/03/19   |                     | 105 | %      | 80 - 120   |

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### RAPPORT ASSURANCE QUALITÉ (SUITE)

| Lot AQ/CQ  | Init | Type CQ        | Groupe       | Date Analysé | Valeur      | Réc | UNITÉS | Limites CQ |
|--|------|----------------|--------------|--------------|-------------|-----|--------|------------|
| 1283256  | JL1  | BL. LIXIVIAT   | Fluorure (F) | 2014/03/20   | 1,<br>LDR=1 |     | mg/L   |            |
| 1283256  | JL1  | Blanc fortifié | Fluorure (F) | 2014/03/20   |             | 110 | %      | 80 - 120   |
| <p>LDR = Limite de détection rapportée</p> <p>Blanc de lixiviat: Blanc contenant les réactifs utilisés dans le processus de lixiviation. Sert à évaluer toutes contaminations de procédure.</p> <p>Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.</p> <p>Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.</p> <p>Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.</p> <p>Réc = Récupération</p> |      |                |              |              |             |     |        |            |

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